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Minimizing Manual Operations in Handling Materials

By Frank W. Curtis
Western Editor, American Machinist

MATERIALS handling equipment at the Pontiac Division of the Oakland Motor Car Company is considered as necessary to manufacture as machinery or tooling, and as important as the human element. Relatively speaking, materials handling equipment is thought of as a tool of production. Without a satisfactory means of transporting materials from one operation to another, or from one department to the next, or even through the assembly line, an efficient production schedule cannot be maintained. Therefore, at this plant every means of having the work progress systematically has been given careful consideration in order to avoid congestion, as well as stock shortages.

Even though trucks and trailers are used to transport equipment around the shop, the general tendency is to eliminate as far as possible this type of conveyance for interdepartmental work by substituting whenever possible gravity-roller or overhead, power-driven conveyors. By doing so the aisles of the shop are kept clear and, when trucks do have to pass through them, there is little hindrance in their course.

The Pontiac plant consists of three main buildings joined together as if one large structure. The machine shop is 530x880 ft., the assembly building 180x1,260 ft., and the car storage section 432x762 ft. Approximately 31,250 tons of raw material monthly, or 60 carloads daily, are handled. The handling of this material is carried on by 180 men, of whom 20 are engaged in clerical duty. On this basis the value and importance of handling materials automatically can be easily understood, especially when it is considered that a large percentage of the tonnage is handled several times. Apart from the conveyors used, there are 14 tractors and 40 electric and power trucks in service.

One of the outstanding advantages in the power conveyor, aside from production efficiency and a decrease in labor, is the reduction of losses due to damage in handling. Parts like radiators, for example, require

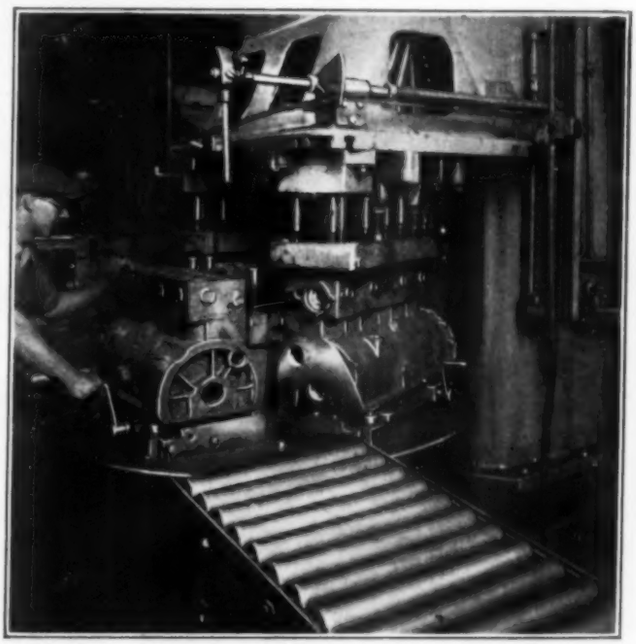


Fig. 1—A section of the roller conveyor used in transporting cylinder blocks through the machine shop. By proper arrangement almost all lifting by the operator is eliminated

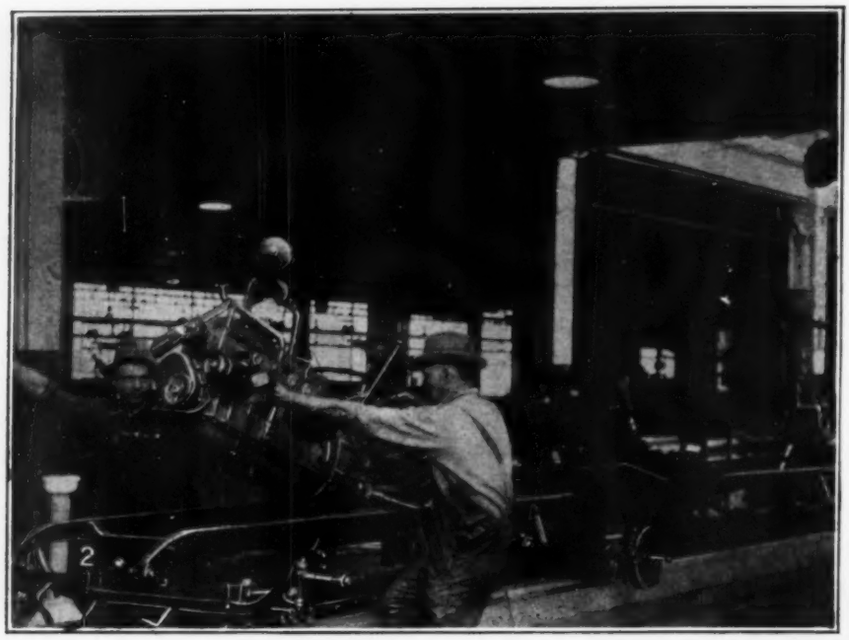


Fig. 2 — Many of the sub-assemblies are stored on the balcony of the assembly building and are lowered by electric hoists to the chassis, transported by a power-driven chain. Here is shown a motor being lowered to a frame

Fig. 3 — Rear axles are transferred from the freight cars in which they are received to the elevating conveyor shown here, by which they are raised to the balcony over the point of usage in the assembly line

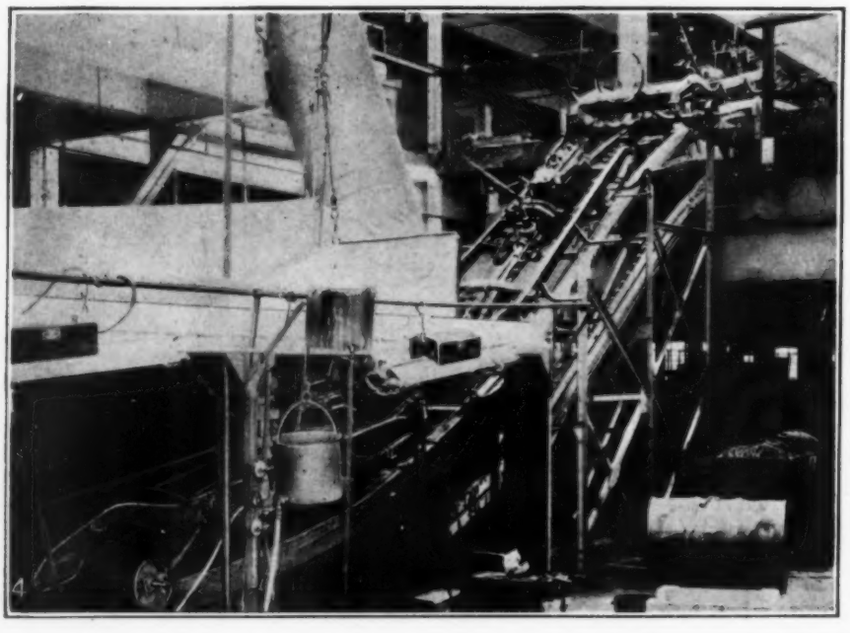
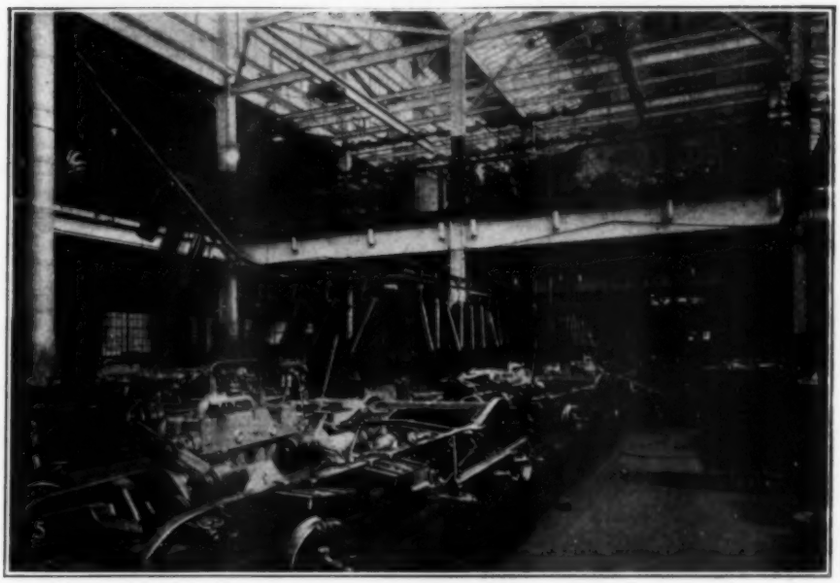


Fig. 4—On account of the extreme overall length of the assembly line a section toward the center is carried overhead for a distance of approximately 30 ft., in order that an aisle for stock transportation may be available. This arrangement does away with the routing of trucks around the end of the line

Fig. 5 — Several overhead power conveyors are used in transporting finished parts from the balcony to the assembly line. Here is shown one of the conveyors distributing gas tanks to the assembly floor. The conveyor is of the endless type and passes all three assembly lines, returning to the balcony where it is again loaded



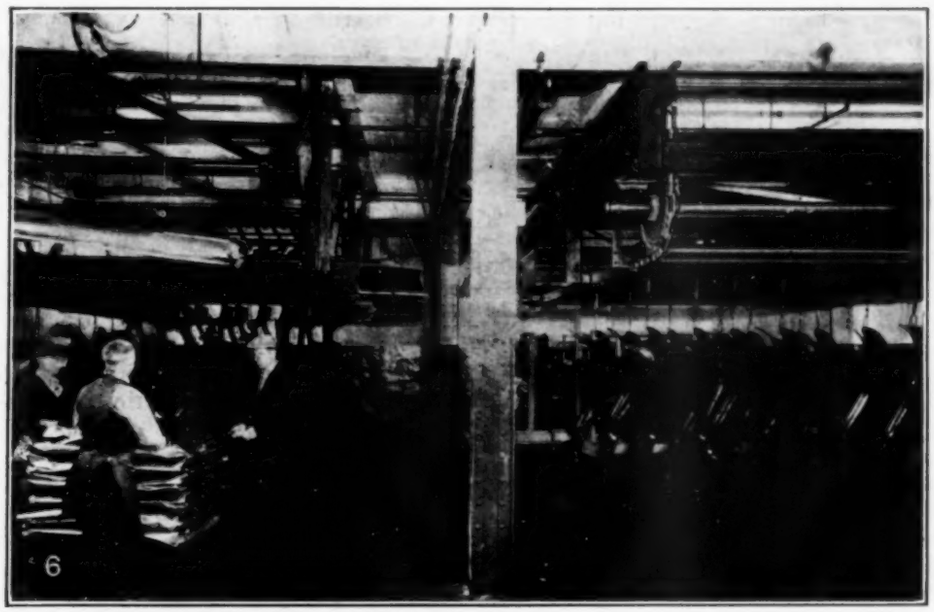


Fig. 6—Power conveyors that are used in transporting fenders and running boards. The parts, received at one side of the building, are placed on the conveyors and are carried to the assembly line

Fig. 7 — In addition to lower costs, and greater production efficiency, power conveyors have the added advantage of reducing losses due to handling. Here is shown the method of conveying radiators to the various assembly lines. Transporting the work out of reach of possible injury has reduced the number of rejects to less than one per cent

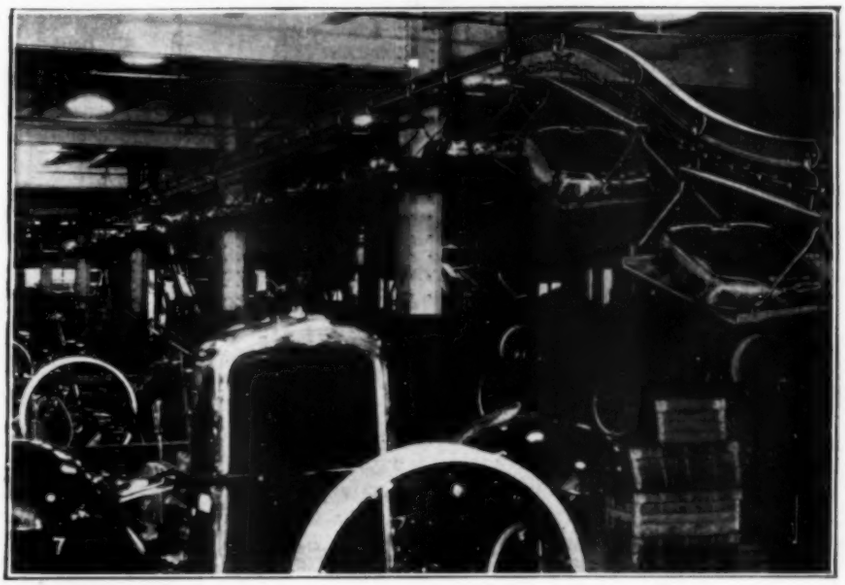


Fig. 8—Tire and wheel assemblies are elevated to the assembly line from a lower level by means of an incline power conveyor. The wheels pass on a roller conveyor of the gravity type to the edge of the incline. The elevating conveyor is timed with the main assembly line, so that wheels are delivered as needed

careful handling. On such work the losses have been reduced to less than one per cent.

Transportation of cylinders through the machining department is carried on mostly by roller-type conveyors arranged between the machines in such a way that lifting is unnecessary. An example of this type of conveyor is illustrated in Fig. 1, which shows an indexing-table, multiple drill positioned adjacent to a straight roller conveyor. The loading and unloading station of the indexing table is in line with the conveyor, and the operator slides the castings from and to the rollers. The headpiece shows another arrangement of a roller conveyor, for handling cylinder blocks. Here transfer of the work is aided by a bridge plate attached to the conveyor frame and resting on the machine table.

The final assembly building has a balcony surrounding the outer walls and which is used for the storage of the larger sub-assemblies such as axles, motors and transmissions. Most of these units are transferred from other parts of the shop by power conveyors. Motors, for example, after having passed the block test, are placed on a conveyor that transports them overhead for a distance of approximately 3,000 ft. before they reach the unloading point at the balcony. A day's output, or 1,000 engines, is on the conveyor at all times. The unloading point is located over the assembly lines, and lowering of the motors to the chassis is handled by an electric hoist, as illustrated in Fig. 2. The same method is used in connection with the assembling of bodies.

Rear axles, received assembled, are unloaded from freight cars and placed on the power conveyor shown in Fig. 3, which raises them to the balcony floor level and then to the location where they are to be lowered and assembled to the frame.

The main assembly lines are of such length that transportation within the building would be hindered to some extent if it were not for an overhead "break" located about midway between the ends of the conveyor, as illustrated in Fig. 4. Without the elevation of the conveyor, all inside trucking would have to be routed around the ends of the line. Running-board panels are assembled to the chassis during the time consumed in passing across the balcony, a distance of approximately 30 ft. The aisle is used chiefly for the transportation of small parts and accessories to the points of usage between the assembly lines.

Power overhead conveyors also aid in transferring finished parts from the balcony to the assembly lines. In Fig. 5 is shown the method of distributing gas tanks to the lines. The conveyor is of the endless type, passing the three assembly lines at convenient unloading locations, and then returning to the loading position.

Another power conveyor is illustrated in Fig. 6, this one being arranged for the transportation of fenders and running boards. A section of the radiator conveyor is shown in Fig. 7. This unit has convenient drops where the radiators are unloaded.

Although most of the sub-assemblies are routed via the balcony, the wheel and tire unit is an exception, since these parts are carried by a power conveyor from a sub-level, or basement, to the main lines. One of the elevating devices is shown in Fig. 8. The speed of the conveyor is timed, so that the wheels reach the assembly line only as needed, or in relation to the travel of the chassis conveyor.

The materials-handling devices described require little attention from a maintenance point of view, with the added advantage that they tend to keep the stockroom on a conveyor, thus keeping the inventory low. Savings created by such means of transportation pay for the conveying equipment in a relatively short time, according to records on actual installations.

What Modern Equipment Has Done for a Washing Machine Builder

As other articles in this series have shown, modern equipment pays in any type of manufacturing plant. Next week's article tells what it has done for one of the largest manufacturers of washing machines, The Maytag Company of Newton, Iowa.

How Much Overhead?

AN ANIMATED discussion was in progress at a side table in the Business Men's Club. "Here comes Bill Holland," said one, "let's ask him to sit in on this. We'll all get some ideas. Come join us, Bill," he said, turning to our consultant at large.

"What's it all about, boys?" asked Bill as he sat down.

"Overhead, Bill," spoke up Frank Watson, who was one of the older men in the group. "Of course it's an old subject, but it doesn't seem to be settled by a long ways. We were discussing what percentage of overhead was best for a paying business. What has been your experience, Bill?"

"How long is a piece of string, Frank?"

"Depends on the string, of course. What's that got to do with overhead, Bill? Sounds like a foolish question to me."

"It is, Frank. But no more foolish than yours. The best overhead depends on the shop, the conditions, and many other things. And it may easily vary from year to year."

"Don't quite get you, Bill. We used to think a hundred per cent overhead was high. And I've seen statements by management experts, who said it should never exceed a hundred and fifty. But young Walter Mackey here says that's out-of-date, that overhead may be the best thing about the plant. Can you beat that, Bill?"

"There's no use talking, Frank, until we know what we're driving at. I suppose you figure overhead on direct labor as we've been doing since Noah started business after the flood."

"Well, why not, Bill? Isn't that the right way to figure it?"

"The great objection to using direct labor as a base is that it gives old timers like us heart failure to see the percentage rising as it does with modern equipment. We are very apt to be so scared at big overhead we entirely forget to look at either low production costs or profit. We set up a bugaboo of one hundred and fifty per cent and forget everything else."

"That's what I've been trying to tell them," spoke up Mackey. "They can't seem to realize that as we lower direct labor costs, overhead, based on this cost, must go up."

"You're quite right, Mackey. In the days when direct labor was the main cost, a hundred per cent might have been quite enough for overhead. But in a modern shop, where we spend hundreds of thousands of dollars on high-production machines so as to reduce the cost of direct labor, overhead frequently goes sky high. These machines frequently cut the labor cost in half. And when you use this reduced labor cost as a base, you can't help seeing overhead going up. Nor does it necessarily mean bad management. It may be the best management under the present conditions."

"But don't you think we've got too many frills in the shop now, Bill? Too much system, too many clerks, too many reports and a lot of non-productive labor?" spoke up Watson.

"Frequently yes, Frank. Neither Mackey nor I is advocating any unnecessary expenses. The final answer is the cost of product and the dividends. It's difficult for us to readjust our ideas on spending money for anything but direct labor. But a new machine that enables a man to produce five times the amount of work for a dollar is a mighty good kind of overhead to have around the shop. I sometimes think we might feel better about overhead if we had special names for it."

"What difference would that make, Bill?"

"No difference in the bankroll. But we might not feel so panicky if we could get over the idea that all overhead was a waste of money. If we consider machine cost as productive overhead just as we do direct labor, and separate it from such expenses as insurance, building depreciation and the like, we'd realize that it was reducing costs

instead of adding to them. Overhead of this kind is one of the best things in the plant, as Mackey says."

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

Discussion

Too Much Inspection

Having been responsible for the inspection of such varied products as calculating machines, micrometers, measuring machines, and textile machines, I realize that no specific rules can be laid down, that can be applicable to all. What may be an ideal method of inspection for one class of work may be ridiculous for another. Even for one machine alone, it would be absurd to inspect all parts with the same degree of accuracy. Many parts of measuring machines require not only 100 per cent inspection, but a double check to insure absolute accuracy, while the supports and other parts need only the most casual examination.

If the mechanic sees faulty work passed through, he thinks he can "put it over" again. If he finds a large percentage of his work scrapped, he is not likely to let it occur again. If an under inspector sees work passed that he has rejected, he is not likely to be so thorough next time.

Carelessness in holding limits is often caused by putting close limits on non-vital parts, which the mechanic knows to be both unnecessary and absurd, and he begins to think that if holding one part to size is not necessary, he has the right to "take a bit" on the more vital parts. Strict uniformity to limits for inspectors is the only way to uphold good work. —ALFRED LAYZELL.

The inspection department does not manufacture the parts. It, therefore, cannot be held responsible for the quality produced by tools and men over which it has no jurisdiction. The logical place for such responsibility is upon the shoulders of the process departments, which are trained in their respective operations.

Where production foremen are held responsible for quality as well as quantity, there develops a keen interest in lowering the quantity of rework and scrap; for no outside department, such as inspection, can be blamed by them for authorizing the continuance of production which is not up to standard. Such defective production, when repeated, is quickly curbed, as no self-respecting foreman is desirous of receiving repeated written inspection reports, inscribed in red with 2nd, 3rd, or 4th occurrence. Furthermore, comparative cost cards amply indicate a condition for which a respective department is answerable, especially when supplemented with a monthly report to department heads of all closed-out orders that have an excessive quantity of scrapped work, stating in which department it occurred.

When the production and inspection heads do not agree, a higher and mutual authority is resorted to for consultation. It suffices to say that the production and inspection heads are not going to remain at "loggerheads" any length of time if they intend to produce for the same company.

—LOUIS P. MARIEN.

Inspection problems are problems for individual solution. Each case must be decided on its individual requirements after a study is made of the problem. It is an entirely different matter to decide what amount of inspection is required on a cylinder block and that necessary on the bolts used to attach the oil pan to the crank case. This holds true through the entire line of manufacturing. Enough inspection should be given to make sure that the resulting parts will perform their required functions without any unnecessary hand fitting.

In regard to the methods of inspecting, much the same reasoning holds true. Some parts should be inspected during processing, others only require occasional inspection to make sure that they are coming through within the prescribed limits. A great deal of inspection can be made automatic by correct design of jigs and fixtures which can be made to accommodate only those parts that will pass the inspection tests. Where such fixtures can be used, it relieves the inspection department of much work.

Another angle of the inspection problem is the training of operators to act as process inspectors, and have them call attention to any work which is not up to standard. Much can be done along these lines, and by careful training a satisfactory grade of work can be turned out which will need but a slight final inspection.

—EDWARD M. PIERCE.

Interesting Men in the Shop

In order to be real engineers—engineers with the greatest possible efficiency—we must know human nature. We all have to do hard work, and it is no wonder that we become hard men. Very often contrasting views render the common work more difficult, and we all know very well the effect of the right word in the right place and how little talks bring out our points of common interest and things lose a little of their hardness.

A little experience. We build electric

driven locomotives. On the first run of the first locomotive we made the painful discovery that the machine operated with heavy recoiling motions. Investigation revealed that the clearance in the axles was too great. The repair of this first locomotive eliminated the trouble. Our men seemed to think that the accuracy demanded in these axles was too great, and the second locomotive also showed recoiling motions. The twelve mechanics concerned were taken along on the next test run, their heads vibrating in time with the recoiling motions of the locomotive. This was sufficient! All twelve men were taken on the second test run and on all 12 faces one could see surprise—the vehicle ran without recoiling motions. No further trouble was experienced from this source.

Mr. Holland is right. The men should know when they have done good work. When I get the information that a locomotive has made a good test run, I tell my men. To tell a man that he has done good work means that we are fair enough to say that he has a part in the results of the plant.

—FRANZ BERMAN, *Austria.*

Paying Express Charges on Replacements

It is to the best interests of suppliers to replace defective components at their own cost inclusive of carriage both ways. It is bad enough to supply a dud. Courteous and prompt replacement, and courageous shouldering of the entire charge, may go far to counteract the irritation that the customer naturally experiences at the outset. There is no better advertisement than that of a satisfied customer, and there is no worse one than the dissatisfied customer. —W. R. NEEDHAM.

Royalties to Company Officials

It seems to me that no one in the discussion has made the correct analysis of the problem. To arrive at the correct analysis one must first consider the general superintendent's motives. If he works for an unappreciative, selfish, grab-it-all company, he is only partly right for the reason that he should have left the employ of the company when he first discovered its attitude. Perhaps he was unable to secure a position equal to the one he held with this company, and in spite of knowing the attitude of the executives, decided to stay. There is still no question but that he was wrong, for his company paid him for the knowledge he acquired.

Now suppose his company is an appreciative company and does treat and pay its employees well. Still, the general superintendent is wrong, and I cannot see, under any circumstances, a justification for his act, even if the pump was perfected at his own expense. During the development, there can be no question but that his mind was on the pump and not on his duties at the plant. His inefficiency would be, in turn, reflected by those whom he had direct charge of, causing them to be inefficient also.

If we assume he was paid a fair salary and had an assured future, he certainly showed a streak of selfishness and rank disloyalty to his company. In my judgment, he should be discharged immediately, taking his pump with him.

—ALLAN T. HILL.

A Question of Family Income

There is a growing tendency to utilize cheap labor, particularly in the light manufacturing trades where the introduction of automatic and semi-automatic machinery has been most notable. The local labor exchange will have only a temporary effect, if the conditions in England are a criterion, for the books show a large number of willing applicants for any jobs that are vacant.

The individual employer has no responsibility, particularly in the case of the non-adaptable operator. National and co-ordinated action eventually must be taken to maintain the standard of living on the family basis, or an all-round decline of consumption is inevitable with dire results to employer and employee alike. If such action is not taken, one wonders who will mind the baby during the next generation.

—H. BROWN, *England.*

In our organization men who have given years of faithful service are not discharged because a new machine enables cheaper labor to do the work, or because they have outlived their usefulness. They are given some kind of a job that they can do. The result is that every man in the organizaion is always doing his best for the firm's interest. There is no labor turnover because the employees cannot find a better place to work. Production is cheaper than in most firms using the former method, because the employees are one hundred per cent for the firm, knowing that they will always get a square deal. Many of the employees who should have been discharged at one time later turned out to be among the best men.

—W. J. OWENS.

In this day of mechanical progress, Carey did the only possible thing by installing labor-saving machinery. But this always means that somebody is going to lose a particular job, and Carey must have known for some time that he was going to make the change in the department, and that he would not need Ed Smiley after the change. Knowing Ed as a sober, industrious employee, who was an asset to the firm, Carey might have told Smiley of the contemplated change, and prepared him for another job. If he had done this Carey would not have felt any upset of conscience. —J. D. ZAHM.

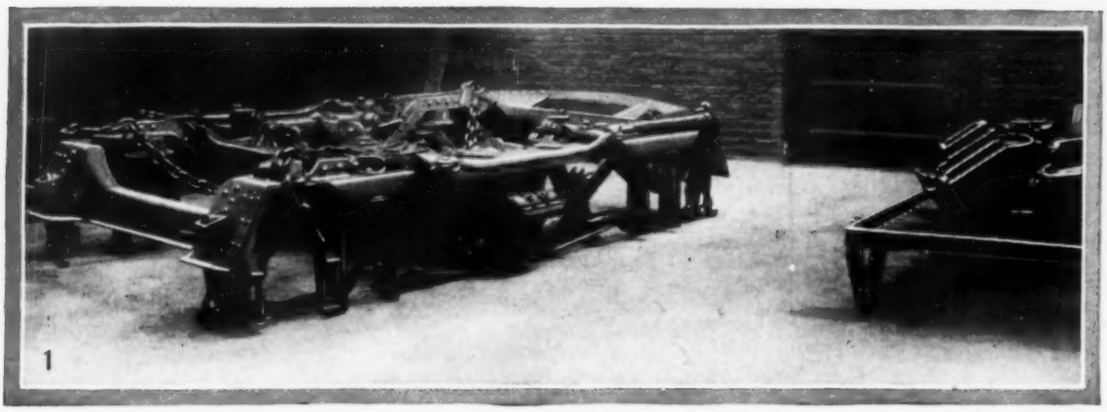


Fig. 1—A truck and the journal boxes ready to be repaired. The truck frame and the parts have just come from the cleaning bath. They can then be handled easily and quickly. It will be noted that platforms for shop lift-trucks are used in this department for storing parts

Truck-Frame Repairs

Photographs by courtesy
of the Brooklyn-Manhattan Transit Company

Fig. 2—Cutting off the heads of rivets holding parts that require replacement. After the heads have been cut off with the torch, the rivets are driven out with an air punch. Replacement of worn parts is then possible, and the trucks are ready to have new parts riveted in place

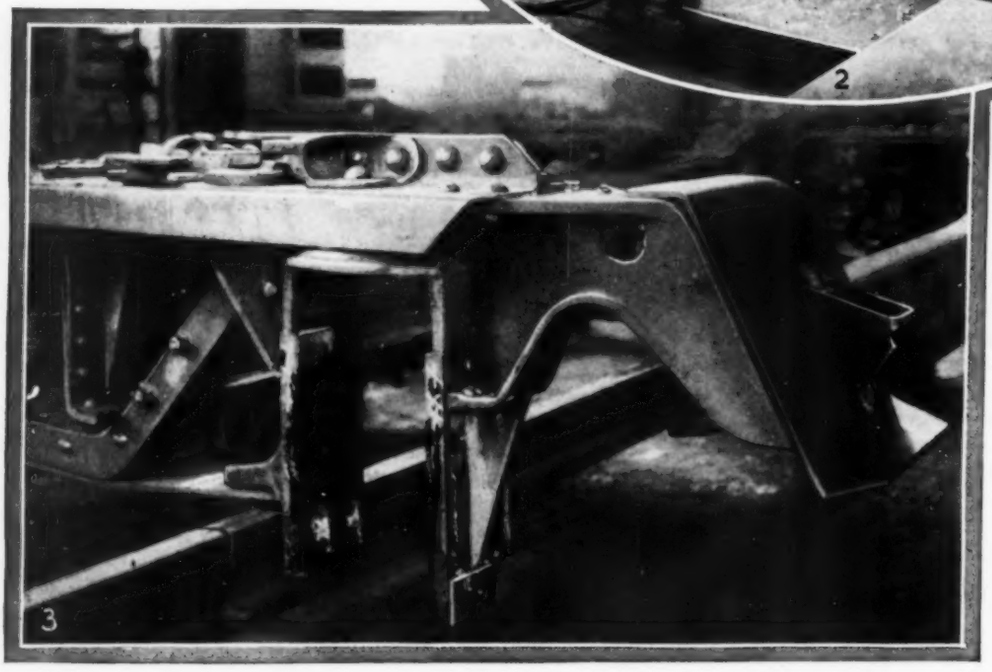


Fig. 3—A corner of a truck after the rivet heads have been cut off. Chalk marks were put on by the inspector to show what parts need replacing. In this case, the wear plates on the sides of the jaws are to be renewed

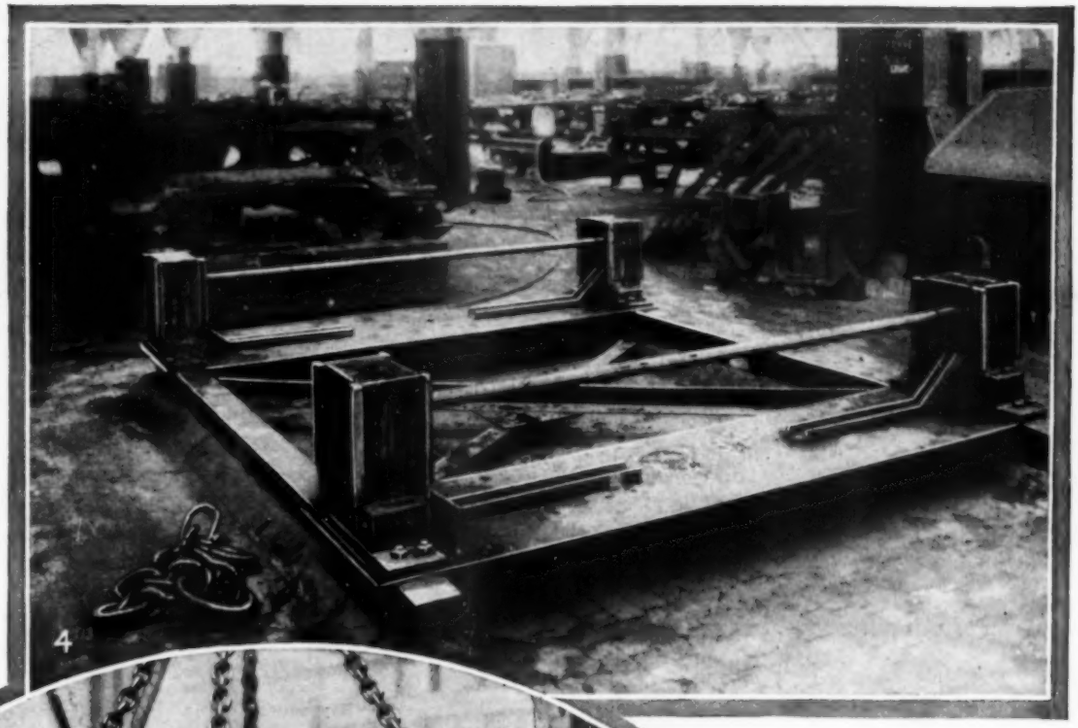


Fig. 4 — Fixture for testing the squareness and alignment of the pedestal jaw. This fixture is built on a framework of structural steel embedded in concrete, and is a permanent fixture. The four posts representing the journal boxes are carefully adjusted so as to insure correct alignment

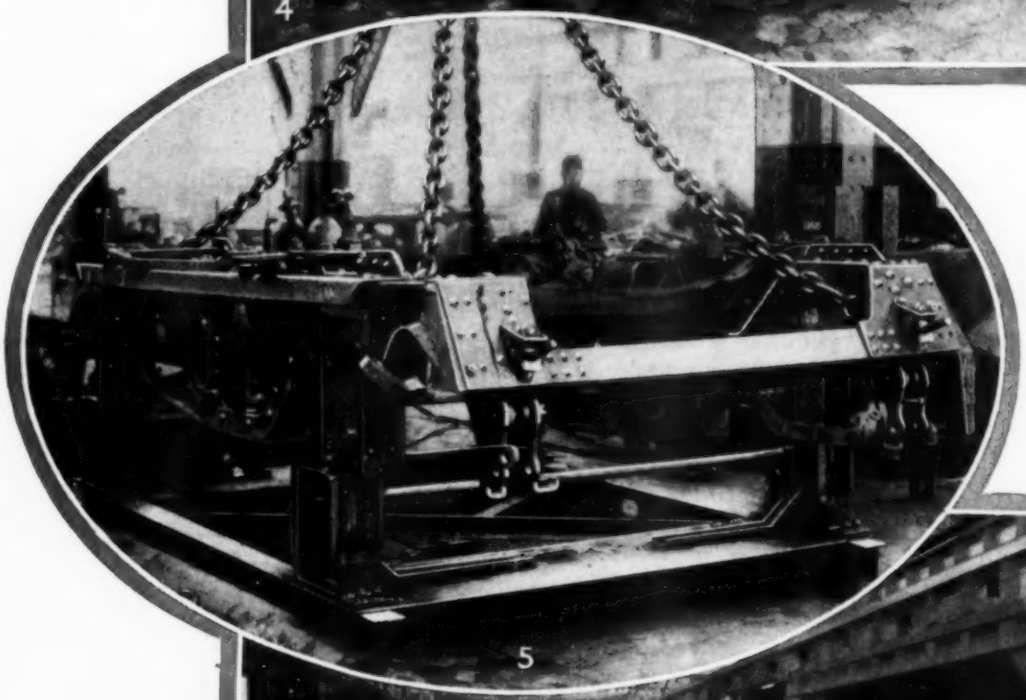


Fig. 5 — This view shows the frame being lowered over the four uprights on the alignment fixture. If the four pedestal jaws fit over the uprights, alignment of axles and bearings is assured

Fig. 6 — Spring compressing device for helping to put the bolts in place under the journal boxes. The outer arm of the device hooks under the wheel tire and the long lever enables the helper to compress the spring sufficiently to insert the bolts under the journal boxes

THE · FOREMAN'S · ROUND · TABLE

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

A Chance to Grow

ED WORE a scowl that added nothing whatever to the beauty of his rather homely countenance. It meant, however, that he was thinking about something that puzzled him and Al recognized the symptoms at once.

"What's eating you?" he inquired genially. "You look as though the tax collector had just told you about a mistake in your return."

Ed brightened a little. "It isn't as bad as that, but there is something I don't understand, and it bothers me."

"You're not the only one who has that trouble. What's the cause of it this time?"

"Well, it's this way. I listened to a political speech on the radio last night and this morning I read part of it in the paper to be sure I got it straight. There was a lot said about every man having a right to a chance to make good. What's so hot about that? Hasn't everybody got a chance, in other countries as well as these dry United States?"

"I used to think so," replied Al. "But only last month I got a letter from a cousin of mine on the other side who's worked in a lot of shops over there. He wants to come back here and is trying to get the money together so he can. But he's having a tough time because they only pay him just enough to live on. He was in this country for a while before the war but had to go back.

"He says there isn't a Chinaman's chance for a workman to get out of his class there and work up to a better job. Says the bosses don't want 'em to get any more money, or be anything but just workmen all their lives, and he's fed up with it."

"Umph," grunted Ed. "Maybe so. But it don't sound reasonable to me. Never been over myself, of course, but how the dickens do they ever get ahead if nobody has any chance to work up? Seems to me they wouldn't have any pep left after a few years of that."

"Perhaps that's one reason they don't seem to be so prosperous. But I'm with you on this equal chance stuff. If I hadn't been able to look forward to this job when I was a machinist, I wouldn't have been worth much. And I'm still looking."

Is Al right about the equal chance being an American idea? Or is Ed justified in his belief that it exists elsewhere? Is it so very important?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Reading the Shop Language

SHOP work requires the intelligent reading of instructions. Such instructions as are presented through the medium of the blueprint are a necessary part of showing the worker how the job should be done. Every mechanic should have a knowledge of blueprints as an aid in understanding his job. When the mechanic is unable to read a blueprint he does not have confidence in his ability to do the work, as he is only half-informed about the work to be done.

The mechanic with a knowledge of blueprints is able to visualize the work he is doing or about to do, and is therefore able to turn out a better product. If he can understand sketches of the work and make them himself he is in a better position to become of greater value to the factory. —J. GURWITCH.

Vacations as a Bonus

BECAUSE of production reasons our shop was averse to giving vacation as a bonus for special service, so we managed the matter otherwise. In many cases the payment of a money bonus is not an adequate reward to the service received, and further, we sometimes want the whole shop to know a bonus has been given, without boasting about it.

We thus have twice a year a special week-end organized for the men we want to reward specially. It consists of a trip of three days at a sea-side or mountain resort, grouping not only those interested, but also their families. The party is guided by two or three members of the staff, and all expenses are paid by the works.

It is, perhaps, a little more costly, but it has proven satisfactory as it does not interfere with regular work. The fact that the whole household benefits makes its members proud of the men, for whom it appears as a good incentive. It also tends to create more friendly relations between management and workers.

—ROBERT A. CAUSSIN, *Belgium.*

Should the Men Support Their Own Club?

OUR president put the matter of such a club before the men, offering to give them a club house at a cost of $20,000 provided each employee who was likely to use it would agree to pay 25 cents per month. When a vote was taken it was found that 96 per cent of the employees voted "yes." The club was built, containing a reading room, a large lecture and dance hall, bowling alley, pool room, shower baths, library, and other accommodations. We have spent many happy times in this club house. It has been well worth the small fee of 25 cents per month, and, like Al, I think that the men should help to support the club. —A. MELDRUM.

I HAVE the honor of belonging to a club connected with the factory where I am employed, in which every member from the president of the concern down pays dues, and we want to pay dues. It is *our* club. We vote to spend a considerable amount of money for one thing or another during the course of a year, but it is *our* money, and there are absolutely no strings attached to it.

The club that I have reference to is the largest and one of the best of its kind in the city, if not in the state. It has the good will and is looked up to and is respected by the citizens of our city, for it is a real club that is run by its members who pay dues. —CHAS. DOESCHER.

Wear Goggles or Quit

THE idea of penalizing the worker is helpful in bringing the careless worker to see the necessity of observing safety rules. However, firing the man is too drastic a penalty. Deduction from vacation period, or suspension for a day is sufficient penalty. In any event the foreman should look carefully into the matter of why the goggles are not worn before attempting to enforce his regulations. It is the easiest thing in the world for a worker to set to one side the matter of protection if there is the slightest inconvenience to him in the use of the goggles. A just and conscientious action by the foreman will do much to foster loyalty on the part of the worker. —J. BINDER.

WHEN a man receives injuries while grinding, he not only loses his own time, but also leaves a machine idle. When the accident occurs, he also disrupts the functioning of the organization around him, thus causing the loss of more time to which the management is entitled. Accidents often cause the men to become prejudiced against a certain machine through an operator's carelessness. A person does not realize the dan-

THE · NEXT · TOPIC

Holding Back on Piece Work

ADVANCE QUESTION

Ed tells Al about his friend Bill Saunders' experience in finding men holding out piece work on good days. Al says it isn't unusual and tells why. What is the general experience?

gers involved in grinding if he has never met with an accident. The management, however, comes in contact with all these cases and can better warn of the dangers.

I feel that the management has a right to say whether a man should wear goggles, because the management is paying the man to carry out its wishes in regard to how the work should be done. The best way to enforce this rule is to educate the man to see the wisdom of wearing goggles. This method would get results without antagonizing the man, and would show him that the plan was inaugurated for his own and his family's safety.

—CHARLES BRAU.

Handling the Shop Office

SOME concerns expect their shop foremen to read and digest every order or memorandum sent to them during the day. This was the case with a concern I happened to be with several years ago, until the management learned that the department efficiencies were falling down, due to lack of supervision, and were forced to use another method. Each foreman was given a production clerk, a time-keeper, and a general shop clerk. The two former clerks would report to him indirectly. In the same office was also placed the departmental inspection chief. All orders pertaining to production were taken care of by the production clerk, and the timekeeper handled all time tickets, keeping in touch with the main office in regard to such matters. The general shop clerk handled all matters pertaining to the departmental office, and the inspection chief handled all quality matters. If any matter were so important as to need the attention of the departmental foreman, whether it be a question pertaining to inspection, production, or machine repair, it was always referred to him. This method gave the foreman more time to handle his machine problems, the result being that departmental efficiencies were brought up to a much higher percentage.

—FRED A. SCHMIDT.

Hiring in the Open

WHEN a man applies for a position, he is usually at a disadvantage. The firm at which he applies has established a department for receiving applicants, and the department becomes somewhat skilled; but the applicant has little opportunity to become skilled in making an effective presentation of his qualifications. His attention to his daily work makes his habits of expression limited; so that he may become unable to view his qualifications from the standpoint of the prospective employer.

Therefore, if provision is made that an applicant may have abundant leisure and comfort to present his case to a careful interviewer, a more profitable interview will result. The office ought to be business-like, but not awe-inspiring. As an applicant proceeds with his interview with the employment manager, the superintendent or foreman ought to be introduced. —ERNEST SIMONSEN.

ONE of the outstanding qualities of human nature is the desire for a "square deal." From the moment that the applicant enters to apply for work his eyes are open to minor details that the employer may consider too trivial to notice. The air of consideration for prospective workers is regarded by the applicant as indicative of the future treatment he will receive when he becomes a member of the organization. But some companies greet the applicant in such a manner that he brings to his work a certain antagonistic attitude which does not make for pleasant relations. Future contact with the department will always be tinged with an unpleasant recollection of the manner of his entrance, and later adjustment may present altogether unnecessary difficulties because of a certain subconscious antagonism which the worker cannot overcome.

First impressions are the most vivid, and stay with people the longest. Often they exercise an influence in spite of better judgment, and the employee finds it difficult to forget the fact that he was not treated with consideration in his first contact with the company, and consequently, refuses to believe that the company has his best interests in mind in plans in which he is later included. —E. ACKERMAN.

THE man to be hired should be granted a brief interview with the foreman in a room as described so that he might feel more confident and less embarrassed. The man seeking a job can only judge his new employment by the treatment extended. If the new man talks with the foreman he will not begin to expect too much. In fact, he will know then just what to expect, and carry himself accordingly. The old system of peeking through a window conveys the impression of distrust. Immediately a man puts himself on guard for usually the person who does not trust cannot be trusted.

—ROY E. PETERSON.

Helping the Efficiency Engineer

IF THE efficiency man is to "get good money for telling the boss the things he could have found out from his own men" why has Ed not told the boss these things?

The case is not exactly a parallel with calling in the doctor, as in this case it is assumed that the executives have a little more than a general knowledge of their business but rather that of a doctor having a consultation with a specialist. In both cases the advice received need not be acted on if, in the opinion of the inquirer, the proposed treatment is not likely to improve the condition.

In these circumstances Al is certainly justified in hoping that the young man can introduce improvements in methods. He himself, as well as the firm, stands to gain by any knowledge thus acquired. —A. F. GUYLER.

Standards for Machine Finishes

IT IS of a great importance to indicate clearly on the drawings the kind of finish to be used on each piece according to established standards and with the expert's opinion. Not doing it in that way often means excess of labor, cost, and time without justification. I have seen the inside of machined parts, such as shrapnel shells, with a smooth finish that showed a very careful workmanship on the part of the men, but very poor foremanship. —FAUTO BECERRIL.

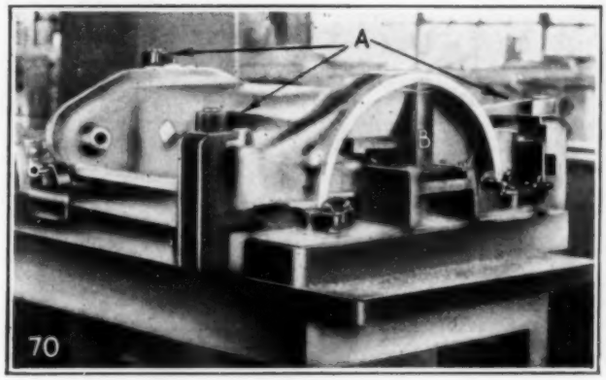


Fig. 70—Checking a rough crankcase casting

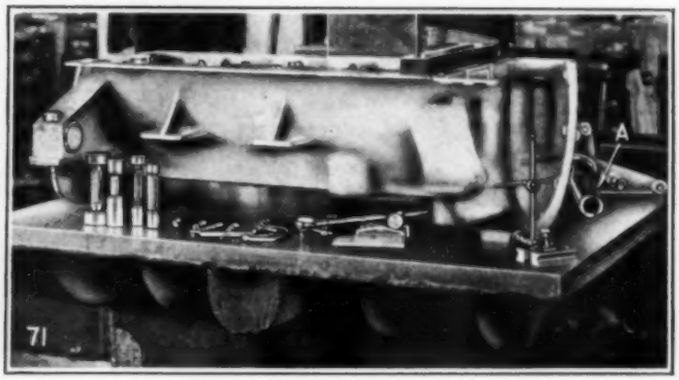


Fig. 71—Testing a finished crankcase

Inspection Methods and Their Application

By Fred H. Colvin
Editor, American Machinist

BEFORE going to the machining department, Pierce-Arrow crankcase castings are inspected on the fixture shown in Fig. 70. The case rests on adjustable supports, and after being properly located, three arms, as *A*, are swung over the three pads which are afterwards milled for locating points. The end target *B* is then moved forward to check the metal in the bell housing end. If the crankcase passes this test it is sure to clean up in the machining operations. After being completely machined and having the bearing caps put in place, the completed crankcase is placed on the surface plate shown in Fig. 71. Various gages check the height and squareness of the important surfaces. One of the special checking bars, as at *A*, fits one of the bearings, and the buttons shown check different points with relation to the main bearings. The gage to be seen in place in Fig. 72 checks the distance between the two bearings shown. By the use of the plugs in the casting, *A*, at the upper end, the various surfaces and the center distances between the crankshaft and the two camshafts used in this particular model are checked.

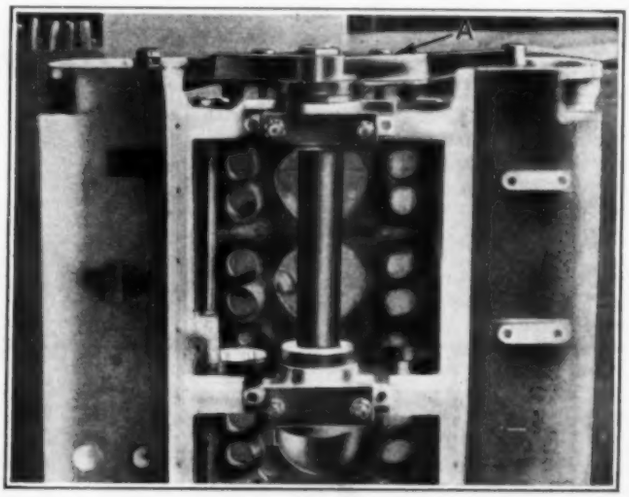


Fig. 72—Checking the crankcase of a dual-valve engine in the Pierce-Arrow plant. The gage is used to check the distance between the bearings and also the locations of the various shaft holes, as well as of the machined surfaces

Another example of the disk method of checking center distances is shown in Fig. 73, here five master disks, representing pitch diameters, are used on test bars to show the relation between the center distances of the crankshaft, the two camshafts and the two outside shafts of a dual-valve engine.

What may perhaps be called the final inspection of the end of a Yellow Sleeve-Valve crankcase, is the final facing operation shown in Fig. 74. After the engine has been completely assembled, the tool head shown is attached to the flywheel and is revolved by turning the crankshaft in its own bearings. In this way the tools take a very light finish cut over the end, and also bore the recess in the flange to its finished dimension. This practice insures the end of the crankcase being square with the crankshaft, and also insures that the bell housing of the transmission will be located so as to be square and concentric with the crankcase itself. The inspection of a finished crankcase in the Yellow Sleeve-Valve plant is shown in Fig. 75. It is supported by the machined surface at the bottom and the plugs, as at *A* and *B*, are used to check the relation of the various holes with each other and with the base. The plugs *C* and *D* locate the cylinder block sidewise and also hold it in position for inspection. Block *E* carries a plug that checks one of the openings at the other end. Similar gages on the other side are used to make a complete inspection of the

Conclusion of the sixth article. The seventh will appear in an early issue.

Fig. 73 — Checking center distances in a Pierce-Arrow crankcase for a dual-valve engine. Five sizing disks, each representing the pitch line of a gear, enable the operator to check the position of each of the five bearing holes

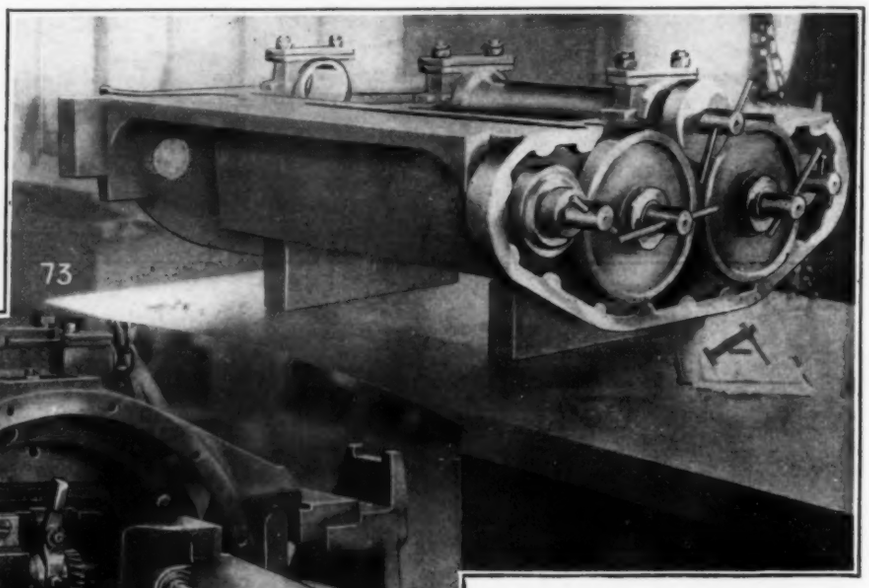
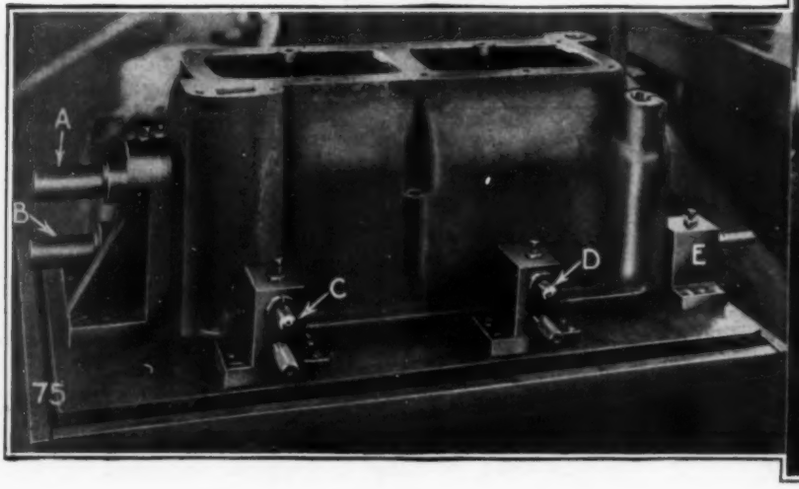


Fig. 76 — Testing the main-bearing alignment of the Stutz 8-cylinder crankshaft. All the bearings are checked to show if each one has the proper amount of end clearance. A careful use of feelers makes it possible to check the small clearance allowed

Fig. 74—The Yellow Sleeve-Valve method of securing both squareness and concentricity of the bell housing face and opening. The facing fixture is attached to the flywheel after the engine has been assembled, so as to insure the proper relation between the crankshaft and the bell housing

Fig. 75—Checking a truck engine casting at the Yellow Sleeve-Valve plant. With the engine supported on its oil-pan face, the proper locations of the various holes and surfacs are checked by means of various plug gages



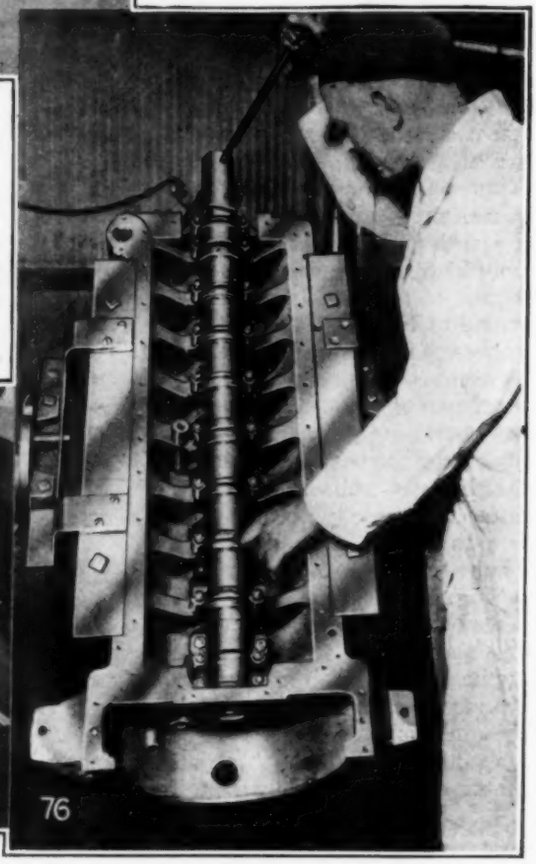


Fig. 77 — The Nash method of checking the accuracy of the surface of the bell-housing joint. The testing rig is suspended from above, and is counterbalanced so as to stay out of the way when not in use. In checking the crankcase, the bar is rotated in the two end bearings, and the indicator on the arm shows the squareness of the face

various openings to be found on that side of the crankcase.

Inspecting the main bearings in the Stutz crankcase, for both alignment and clearance, is shown in Fig. 76. The nine bearings are carefully checked by a bar having but 0.0005 in. clearance.

In Fig. 77 is shown the very convenient method used in the Kenosha plant of the Nash Motor Company for checking the squareness of the bell housing surface with the main bearing in the crankcase. The large master mandrel is an accurate fit in the end bearings of the seven-bearing crankcase used in this engine. The mandrel is suspended from a steel cable, and is so counterbalanced that it can be lifted up out of the way when not being used.

The checking is done by the dial indicator on the arm on the end of the mandrel. With the mandrel firmly seated in the end bearings, it is necessary only for the operator to swing the arm around the face of the bell housing and note the movement of the needle of the dial indicator. Any movement shows whether or not the surface is square within the prescribed tolerance. The care taken in securing squareness of this surface is a good indication of the necessity of having as perfect alignment as is commercially possible between the crankshaft and the drive shaft of the transmission units.

Fixed ideas frequently, because of good results in practice, are apt to become prejudices that are hard to overcome. Crankpin and axle bearings have been finished by rolling for so many years that many feel it is the only correct method. Advocates of grinding come up against a wall of prejudice in most cases. Part of this is probably due to lack of experience with grinding.

SEEN · AND · HEARD

By John R. Godfrey

Is our present method of feeding work against the milling cutter all wrong?

Methods and ideas change frequently as the years go by, but they don't always stay "put." We began discussing the best method of feeding milling cutters about 40 years ago in the *American Machinist*. The controversy waxed hot and heavy. It finally became common practice to feed the work against the cutting tooth. The main advantage seemed to be that this method automatically takes up any slack in the feed screw and prevents the cutter from digging in, as is apt to happen when the feed is in the opposite direction.

Now, however, a milling cutter manufacturer comes along and tells us that the old practice is out-of-date and that for best results the milling tooth should cut *down*. In other words, the work should feed in the same direction as the cutting tooth is traveling, instead of against it as has been our custom.

He has two principal objections to the old method, the tendency of the cutter to lift the work from the machine table, and the fact that the cutting tooth starts to cut with a chip of zero thickness. Even if the work does not loosen on the milling machine table, it can be lifted by the amount of clearance in all of the sliding joints which may make up a total of several thousandths, when all the oil films are considered. Then, too, as the cutting edge becomes less keen, there is a tendency for the cutter to slide over the work until it is forced to bite into it.

This cutter maker's experience with the down feed has, he claims, given phenomenal results that far outweigh the extra care necessary in providing heavier feed screws and extra gib screws at the extreme end of the saddle, so as to keep the gib very tight along its entire bearing. The cutting tooth enters the work with a positive bite, and even though the cutter is dull there is no tendency for it to ride the work in any portion of its travel. The down pressure also helps to hold the work in place and closes all the sliding joints instead of opening them.

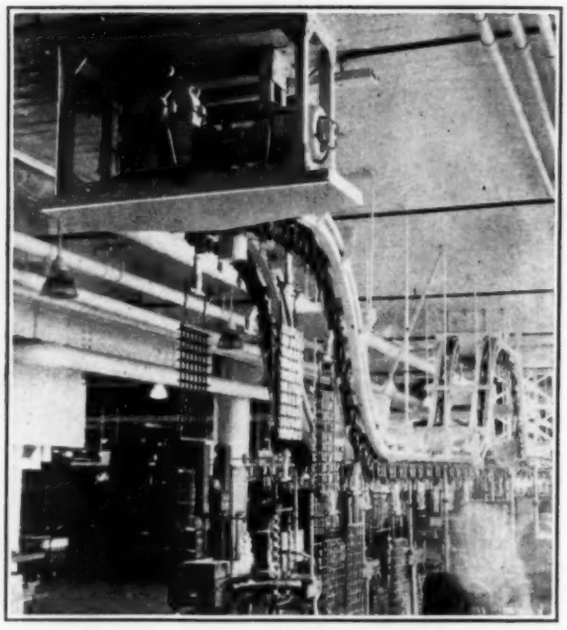
Another item in favor of the down cut is the decrease in power required to operate the machine, due to the fact that the cutter is assisting the feed instead of opposing it. It is this cutter manufacturer's belief that within a very few years, 90 per cent of the milling will be done by the down-cut method. With the possibility of this method apparently in view, some milling machine manufacturers are greatly increasing the diameter of the feed screws and are using fine-pitch threads and long nuts. The down-cut method is also being considered by the users of hydraulic feed mechanism.

Are we about to see a reversal of our former milling practice regarding the direction of feed?

Handling Work Automatically

in the Plating Room

By Ellsworth Sheldon



High production requires the elimination of hand work in finishing as well as in machining—Plating a million parts a day by machinery at a razor plant

WHEN the number of parts to be plated runs into hundreds of thousands daily, it is essential that the department in which the plating is done should be organized and equipped to handle the work with the minimum of hand labor. The more nearly the routine can be correlated to the smooth and closely coordinated functionings of a well-designed automatic machine, the more economically the work can be done and the less will be the likelihood of interference with its orderly progress because of unforseen, and sometimes uncontrollable, conditions.

If the product is at all diversified, it is impossible to eliminate hand labor entirely, but that it can be reduced almost to the vanishing point by careful study of the conditions involved and intelligent adaptation of suitable mechanisms wherever the work is purely repetitive and does not require the constant direction of the human brain, is evidenced by the installation which is the subject of this article.

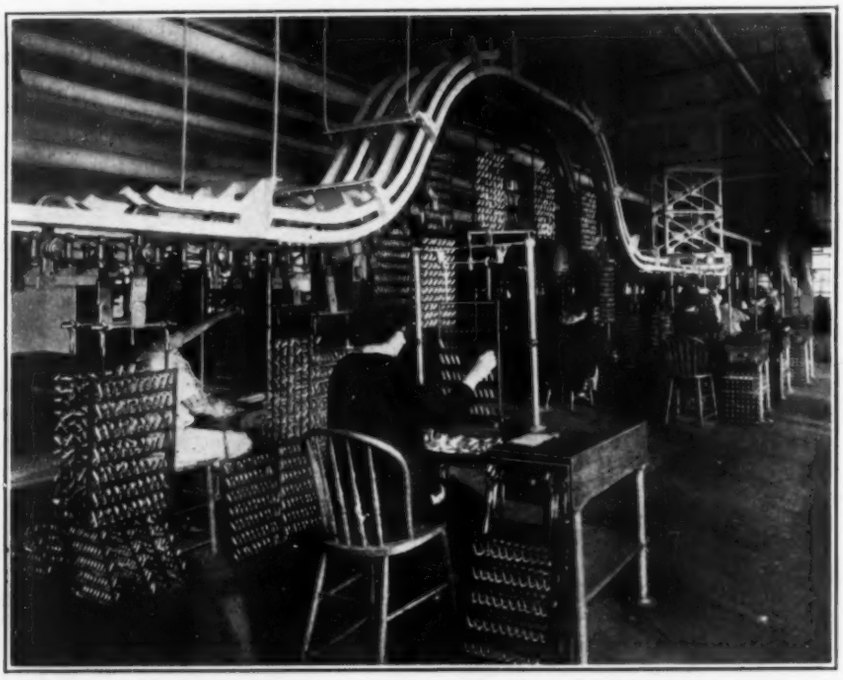
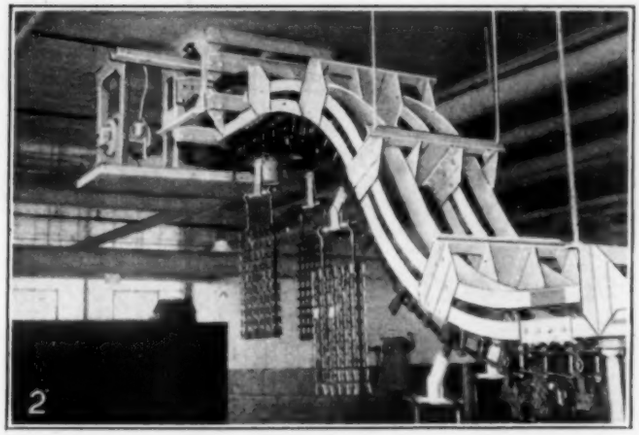


Fig. 1—Loading the racks with work to be plated. The tracks of the conveyor are depressed at the loading stations to bring the racks within reach of the operators. Distinctive racks are provided for each kind of work, and the operator picks off from the conveyor the particular one desired as it passes within reach of her hand

The plant of the Gillette Safety Razor Company at Boston has a productive capacity of more than 100,000 safety razor handles per day. Each handle is made up of five or more parts, besides which there are numerous adjuncts and accessories helping to swell the number of pieces to be plated to very nearly a million. Not only must every piece pass separately through the various stages of the plating process, but it must in passing be so held that it will be in firm electrical contact with the conductor through which current flows.

For this purpose many special racks are provided, each to hold from fifty to several hundred of the particular parts for which it is designed. The exact number of parts held by any one rack depends upon the parts themselves, as all of the racks are of the same size and shape, while the sizes and shapes of the parts vary widely. Aside from a half-dozen attendants whose duty it is to keep the work-benches supplied with material,



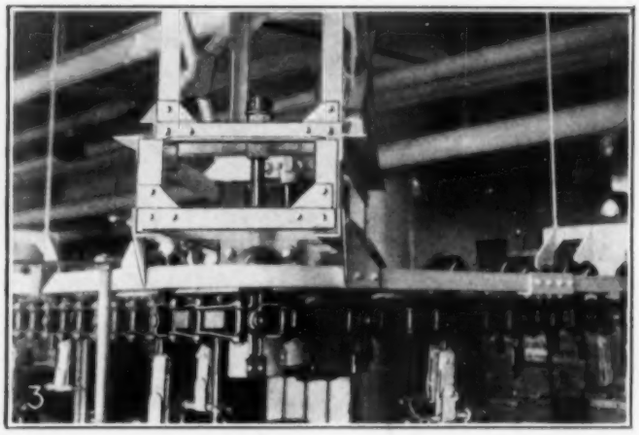


Fig. 2 — The conveyor is driven by a small electric motor through a suitable speed reduction gear. Push-button controls at convenient stations provide means to stop and start the mechanism. Fig. 3—Where the line of travel changes, the chains pass around sprockets on vertical shafts. The 4-in. links pass over 15-in. sprockets

check and send out the plated parts, and to take care of the chemical details of the plating process, the manual handling of the work is done by girls who load and unload the racks as they are brought to and taken away from them by a mechanical conveyor.

The moving part of the conveyor is a chain made of links 4 in. long and hinged to swivel in a horizontal plane, so that it passes freely around 15-in. sprockets carried on vertical shafts at the turning points of the system. Every third link of the chain is made in two parts, so hinged together as to swivel about a vertical plane, thus breaking the chain up into chords that allow it to follow any curve in that plane having a radius of not less than 36 inches.

The supporting track is composed of two rails of L-section, so joined together at suitable intervals by riveted yokes that the lower members of the angles project toward each other, their edges being separated by about 2 in. throughout the length of the track. Rods attached to the yokes, where necessary, suspend the structure from the ceiling of the room. One of the forgings of which each third link of the chain is composed, projects upward between the two rails of the track, and at its upper end carries a pair of flanged ball-bearing wheels to roll upon the rails. A downward projection from the same link-part is flanged and drilled for attaching a work-hanger.

A part of the conveyor is shown in Fig. 1, at a point where the tracks drop down to bring the racks within convenient reach of the girls at the loading stations. As may be seen in this illustration, the track is double, the single strand of chain moving in opposite directions and passing over sprockets at the ends of the system. At the point in the middle distance, where the diagonally-braced structure may be seen, the chain passes around separate sprockets and travels in a direction at right angles to its previous progress.

Passing clear across the room to a similar pair of sprockets, the direction is again changed at right angles and the conveyor returns parallel to the part here seen, but on the opposite side of the room. Thus three sides of a rectangle are enclosed. On one side of the room the empty racks are filled with work to be plated, while on the other side the plated work is removed from the racks and disposed in trays to be transported to the assembling room, or to the finished stock department as the case may be.

Power is applied to one end only of the conveyor. The driving motor and the speed reduction gear may be seen in Fig. 2 on the small platform near the ceiling of the room. At the opposite end, which is directly across the room to the left, the chain merely passes around an idle sprocket. Push-button controls in the motor circuit make it possible to stop and start the conveyor from convenient points. A close view of one of the right-angle turns is given in Fig. 3, wherein the construction of the chain and sprocket may be seen.

Attached to every third one of the 12-in. chain sections, is a swivelling work-hanger consisting of a yoke with a horizontal cross-bar having a small collar at a short distance from each end. The racks hang from this cross-bar by two peculiarly-shaped hooks that are permanently a part of each rack. The hooks are of bronze, as they are depended upon to carry the electric current while the racks are in the plating machines. The purpose of the collars on the cross-bars is to insure proper hanging of the racks thereon and to prevent them from sliding endwise to disengage one or another of the hooks.

Suspension of the individual loads only from the joints of the 12-in. sections insures that there will always be a pair of wheels directly over each joint to bear the weight. The use of but one out of every three possible points of suspension, is to prevent the racks from swinging together and interfering on the angular rises and descents of the conveyor. The swivelling feature of the suspender allows the racks to hang vertically, regardless of the angle assumed by the chain.

At each of the several places where the structure drops down to convenient working height, there are six work-benches, three upon each side of the conveyor. The racks hanging from the slowly- and continuously-moving chain thus pass within easy reach of the operator's right or left hand, as the case may be, and can be taken off of the hangers with little effort or attention.

Each operator, while busily engaged with the rack on the bench before her, is sub-consciously watching the conveyor for the particular racks suited to her work—empty if she is on the "racking" side of the room, or filled if on the opposite side. Without moving from her position, she takes them off of the hangers and sets them on the floor beside the bench. According to the way in which her particular part is passing through the plating machines, her racks may arrive in bunches or they may come one at a time.

The plating machines are themselves conveyors, and require no attention other than of supervision to perform their work. At the point where the conveyor crosses the room, it passes within a few feet of the loading and unloading stations of the plating machines. At this point stands an attendant who lifts the racks of unplated work from the conveyor and hangs them upon the conveyor of the particular plating machine—gold, silver or nickel—through which they are to pass. As any part may be scheduled to receive any one of the three covering metals, it is necessary to have at this point someone who is able to read and understand a shop order as well as to inspect the work of the machines, else even this gap might be bridged mechanically. The attendants here are practical platers.

The conveyors of the plating machines return the work—plated, washed and dried—to the point of entry. Where the same attendant transfers the racks again to the work conveyor, from which they will be removed as they reach the stations of the operators who are to unload them. At the point of approach, the two conveyor systems are so close together that the attendant standing between them can reach them both with outstretched hands, hence he makes the transfers in either direction without necessarily moving from his position.

Work is brought into, and taken out of, the plating room on a vertical conveyor, the enclosure of which may be seen in Fig. 4. This conveyor was illustrated and described in the previously-mentioned article. Shallow wooden trays, some of them fitted with compartments to suit the work, are provided to transport the parts. The attendant at this point receives the work, distributes the trays to the operators assigned to handle the various parts, collects from the operators on the other side of the room the trays that they have filled with plated work, and despatches them to their destination. He has several assistants who handle the work on trucks or carry it to and from the benches by hand, according to quantity. This station is located near the center of the rectangle enclosed by the conveyor, every part of which is thus equally accessible.

At an adjacent desk, the parts are checked in as received, operators are assigned to rack and unrack them, orders showing the number and kind of parts and the plate that each is to receive, are issued to the platers, and instructions are given to the attendants to hang on the conveyor the requisite number of racks

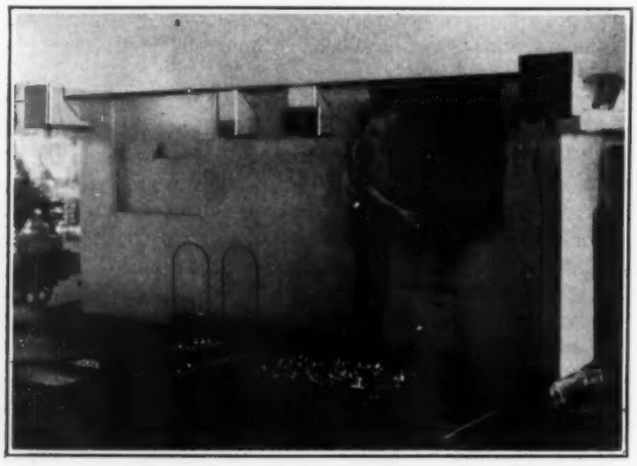


Fig. 4—Parts to be plated are brought into and taken out of the department by a vertical conveyor. An attendant delivers the trays of parts to the girls for racking

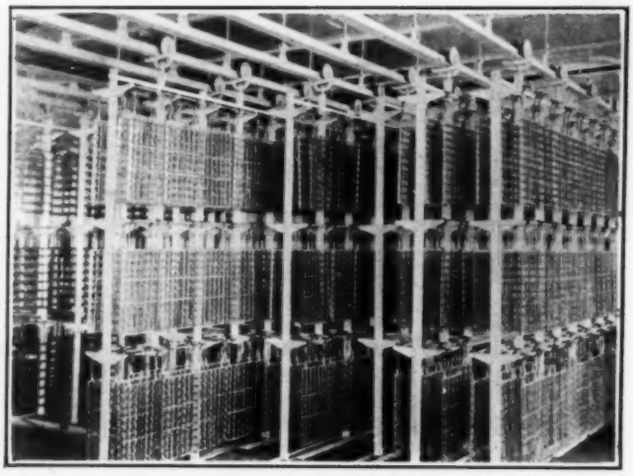


Fig. 5—Special racks are provided for each different kind of part. As the racks are constantly being changed, roller-suspended frames are provided to store them when out of service, yet leave them instantly accessible

of the particular types needed to handle the work. The attendants also remove from the conveyor all racks that have passed out of service by reason of the completion of the job to which they are adapted.

Because of the variety of work handled, a large number of racks are required, and the problem of combining storage with instant availability is neatly solved by the bank of roller-suspended frames shown in Fig. 5, which are located in the otherwise unoccupied end of the rectangle enclosed by the conveyor. Each frame carries a particular kind of rack, and its contents are easily available by pulling it out along the track from which it is suspended. When all of the frames are pushed back to their limit, their outer ends are flush, thus providing maximum storage capacity in minimum space, with any type of rack easily accessible.

The racks are necessarily made of metal, as they must carry the electric current necessary to the deposition of the plate, but all of the parts of the rack, except the springs, clips and other devices by which the work is actually held, are so treated that no plate will be deposited upon them. Even with this minimum exposure of platable surface, a considerable amount of valuable metal will be deposited, and this is recovered from time to time by subjecting the racks to a "deplating" process.

Both sides of each rack are available for attaching work to be plated. Rising from the top of the work-bench is a rectangular frame having near its upper member, a movable bar upon which the rack is hung by the same hooks that support it on the conveyors. The lower member of the rack rests in a groove in a wooden block secured to the work-bench, hence the rack itself is fairly rigid while the operator is putting on the parts. When one side has been filled, the operator depresses a pedal to lift the movable bar and raise the lower member of the rack out of the retaining groove. It can then be turned about to present the unfilled side, and again lowered into the groove to hold it stationary while the second side is being filled.

A rectangular space is cut from the front of each bench into which the wooden trays are fitted. This enables the operator always to have before her a tray—filled or unfilled, according to her job—at convenient working level. The attendant keeps her supplied with trays and takes away those with which she has finished.

Observations on German Shop Practice

By K. H. CONDIT
Editor, American Machinist

AFTER visiting the metal-working plants of four other European countries I spent some days in the best of the German plants. It must be admitted that in these shops the visitor accustomed to the ways of American shops feels more at home than anywhere else in Europe. The equipment, of course, is predominantly German. What else could you expect in a country that maintains perhaps twice as many machine-tool builders as does America? But, there are American machine tools in the better shops, mostly of the high production or special types and they seem to be well thought of by the users. What makes the American feel most at home, probably, is the air of orderly activity that prevails. There seems to be a conviction that there is a tremendous job to be done and that the sooner they get at it the sooner will they find a way out of their troubles. One naturally has a little hesitancy about discussing some subjects with men against whom the United States was at war only ten years ago, yet there is apparently the same feeling about the war in Germany, industrial Germany at any rate, that exists with us. They are glad it is over and hope there will never be another. I talked at length with men who had served throughout the war, some in the army, others in the navy, and I found no evidence for militaristic spirit. Perhaps they were polite, perhaps hiding their real feelings, but I think not.

> In Germany, engineers and operating men generally are interested in "Fliessarbeit"—continuous production—and in putting it in they are meeting with just the same difficulties as did the pioneers in the United States. Equipment is predominantly German, but many American precision and high-production machines are to be found in the really progressive plants

After what I saw in other countries on the continent I believe that one of the most helpful things that has been done for German industry is the rigid limitation of the size of the army. Work in the factories is not disturbed by intermittent periods of military training and the workers do not have to give up the best years of their lives to military service.

The restriction of military activity is not an unmixed blessing, of course. One of the benefits of the old system was the good physical training given to every man. In its stead Germany is trying to stimulate a national interest in athletics and sport. Like that in America, they say. If they are as successful in this endeavor as they have been in other organizing endeavors they may well become more dangerous competitors in international sports, as the recent Olympic games proved.

One of the phases of the sport movement is the so-called "sun cult." The reason for it is the same as for the parallel movement in Czechoslovakia, the relating small proportion of clear, sunny weather. Exposure to sunlight is a real need of the working population in Germany just as it is in the other country, since the greater part of the factory buildings are built of masonry or concrete, with what we should call inadequate window space. The newer ones, however, are in some instances more like ours in their use of steel and glass. Artificial lighting has been given much more attention than in some other places but I got the impression that it was still inadequate in most of the plants. Handling methods in the best shops are just about what one would expect to find in similar shops in the United States. Standard containers, belt, chain and roller conveyors, electric trucks and hand lift trucks are in general use. In the plants where large units are built there is the usual main crane equipment, and in the side bays small traveling cranes of the floor controlled type. "Fliessarbeit," the German equivalent of continuous production, is being given a lot of attention. One of the installations I saw was quite as good as anything I have seen in American shops working on a similar product. The manager even had a recording machine in his office that showed on a moving tape just when each piece came off the assembly line. He was trying to find out when the fatigue periods occurred.

In another plant where the conveyor system looked excellent the machines on the line were almost all old. The superintendent of this plant told me of their difficulties in getting the operators, most of them women, to work according to the new plan when it was first introduced. Some of the obstinate ones had to be discharged but now, when an operator is taken off the line and put on one of the machines where the work has to be moved by hand, she soon asks to be put back.

In the shops where large machines are built the practice differs but little from the practice in American shops engaged in similar work. This is particularly noticeable in the big electrical machinery shops which

have working arrangements with American companies.

The effect of the steady stream of German visitors to America is apparent. Here is where the Germans are strong. They are willing to learn from anybody whose methods they think are good. In almost every plant I visited my guide was a young engineer or assistant executive who had spent from six months to several years in American plants studying American methods. They are a fine lot, these men, and constitute one of the strong cards in Germany's hand.

But everything is not cheerful from the German point of view, by any means. As I have just said I visited three plants where the methods looked excellent. Something is wrong beneath the surface, however, for in each instance I learned afterwards, from German users, that the product was not as good as it should be. Whether the fault lies in the design, in the materials, or in the inspection, I don't know. There was no time to make a careful study and, even if there had been, I learned of the faults only after I had left the plant. The fact remains that if the product is not satisfactory no amount of ingenuity on the part of the production force is going to lead to profitable operation.

"Stratification" of Working Organizations

Another great problem facing the German manufacturer is what might be called the "stratification" of the working organizations. I talked over this question with many different executives and engineers and most of them admit its seriousness. What I mean by stratification is that there are three clearly defined classes involved in the operating scheme—the management, the engineers, and the workers. There may be an opportunity for the engineer to climb up to the executive level but there seems to be a firm conviction that a workman is a workman and should not aspire to be anything else.

Foreman training does not seem to have made much headway but training of apprentices and mechanics is fairly well organized under legislative requirements Another requirement is that each plant employ disabled workers to the extent of two per cent of the total number employed. In devising ways in which the blind and maimed can earn a living the German engineers have been very ingenious. In one plant I saw a blind man operating three high-duty drills each equipped with air chuck. He went from one to the other loading and unloading the fixtures almost as efficiently as a sound man or woman would have done. In another place two blind men worked as a team, one loading a small box jig with brass nuts to be tapped and the other operating the six-spindle tapper. The full and empty jigs passed back and forth with automatic regularity. The first man is supporting a family of four children. The others make as much as the women employed on similar work.

Most of them are brought to work by their dogs for which a kennel is provided during the day. The men arrive a few minutes later than the regular force and leave a few minutes earlier. An apprentice is told off to keep an eye on each one of them, leading him out if he has to leave during working hours and bringing in the dog at quitting time.

It seems to me that one of the difficulties with the German system is that the engineers are trained primarily for design. As one prominent German executive put it, the young engineer aspires to design a beautiful Diesel engine but he has not the slightest interest in solving the manufacturing problems in a shoe factory or in a clothing plant. It was not so many years ago that the young American engineer started in the drafting room as a matter of course. Since then we have learned that the needs and opportunities are greater in the operating departments and both the departments and the new engineers have profited accordingly. Germany is just beginning to realize the soundness of this theory. As she puts it into practice we may expect to see her solve some of the manufacturing problems that still worry her.

Some of Germany's Handicaps

Not until she is able to break away from the rigid class distinctions that still prevail is shop morale going to be what it should be for maximum efficiency. At present the reparations are naturally imposing a heavy burden of taxation on management and men alike. The workman has no margin above bare living expenses, and until he does his purchasing power must remain low. Germans talk about our wonderful domestic market yet they are doing little to develop their own domestic market of practically two-thirds as many people. If they can once break that vicious circle of low wages and low purchasing power and change it into an upward helix, even a very flat one, they will be on the way to prosperity.

It is a hopeful sign that the old tradition of vital trade secrets is beginning to give way at various points. It is also promising that the many standards being promulgated by Germany's amazing standardization organization are finding acceptance in industry. I saw something of that organization and I found it quite remarkable. Some of its work, perhaps, has passed the bounds of practicability but taken as a whole it is doing great things for industry.

One of the pleasantest things about my visits to German plants was the cordiality with which I was received everywhere. It is very easy to be friendly with people who are so anxious to be friendly with you. It was also pleasant to hear from Germans who had visited the states that they were extremely appreciative of the cordiality with which they had been received in our plants.

I sincerely believe that it will be worth while for any Americans engaged in the metal-working industries to visit Germany. They may not find methods and equipment superior to their own but they will see some things that will make them think and I am sure they will get a cordial reception.

Buyers Frequently Increase Sales Costs—*Discussion*

By S. Kupper

TO HELP better this situation, which was the subject of editorial comment on page 216, Vol. 69, of the *American Machinist,* the purchasing agent employed by the company should practice all that is best in business ethics in his association with the sales departments of other companies. Sales managers should insist that their salesmen, before they contact with a company, become intimately acquainted with the routine therein. Moreover, manufacturers and organizations of purchasing agents should co-operate to meet this problem on a constructive basis. Through adequate co-operation on these grounds, selling costs can be substantially reduced.

Hob Corrections for Gear Tooth Modifications

By James A. Hall

Consulting Engineer, Brown & Sharpe Manufacturing Company

A method of calculating the number of modified teeth in contact under the worst conditions, so that continuity of action will be maintained, is illustrated

ONE of the dangers in the use of tip relief, particularly in the case of the larger pressure angles, is that the radial correction may be made so long that the arc of action becomes less than the circular pitch, and continuity of action is lost. For this reason, when corrected hobs are being designed, the number of teeth in contact under the worst conditions should be calculated. The same symbols are used as in the early parts of the aritcle: pressure angle = VP; correction angle = VC; addendum = A; working addendum = WA; radial correction = RC; tip correction = TC; normal correction = NC; working addendum of rack = RWA: pitch-line correction = PLC = distance intercepted on pitch line by the tooth curve and the correction curve extended; pitch radius = PR; entrance angle = VE; outside radius = OR. As in the previous charts, the number of teeth in contact can be plotted in terms of the working addendum in per cent of the pitch radius. Referring to Fig. 9, let a be the last point on the working addendum of the tooth. The angle of recess VRe, treating this gear as the driver, will be as noted. The angle H has been figured for the standard pressure angles in getting the data for the tooth correction charts. The angle M is the limiting angle of approach and is equal to tan VP. The value of the angle of recess then becomes

$$WR = H - \tan VP$$

By the use of this equation, curves showing the angle of recess for the standard pressure angles can readily be calculated and plotted against addendum per cent as a base. In Fig. 10 these are shown.

The procedure in using this chart is to treat first one gear and then the other as the driver, find the angle of recess and divide the product of this term and the pitch radius by the circular pitch to get the teeth in contact in recess. The sum of the figures for the two gears then gives the total number of teeth in contact. The whole number in this result gives the pairs of teeth which are in contact all the time, while the decimal indicates the proportion of the time an additional pair are in contact. One limitation to this procedure is the interference point on the driven gear due to tangency of the path of contact with the base circle. The angle through which the driven gear turns in moving from contact at the pitch point to the interference point is tan VP, so the teeth in contact in recess under this condition are found by dividing the product of this term and the pitch radius of the driven gear by the circular pitch. This figure should be used if it is lower than that obtained by the method of the previous paragraph. The use of the curves in Fig. 10 for getting the number of teeth in contact is illustrated by the following problems.

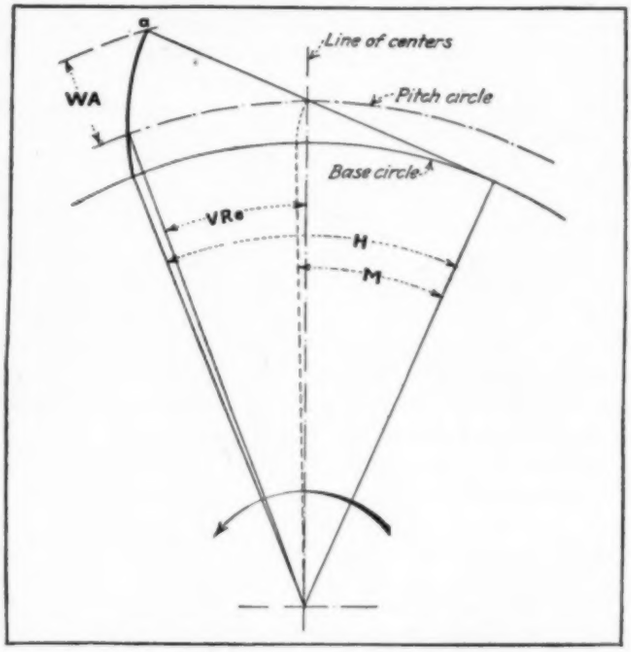


Fig. 9—Development of the angle of recess

(E) How many teeth are in contact in a pair of 24-teeth, 3-pitch, 20-deg. pressure angle gears, having a radial correction of 0.100 in. on each gear?

1. Find the working addendum per cent of pitch radius for the driving gear.

$$\frac{WA}{PR} = \frac{0.2333}{4.0} = 0.0583, \text{ or } 5.83 \text{ per cent}$$

2. Determine the angle of recess on the 20-deg. line of Fig. 10, point *a*.

3. Determine the number of teeth in contact in recess by dividing the product of the angle of recess and the pitch radius by the circular pitch.

4. Check for interference limit on driven gear. Teeth in contact found by dividing the product of the pitch radius of the driven gear and the tangent of the pressure angle by the circular pitch.

The third part of the article. The conclusion will appear in an early issue.

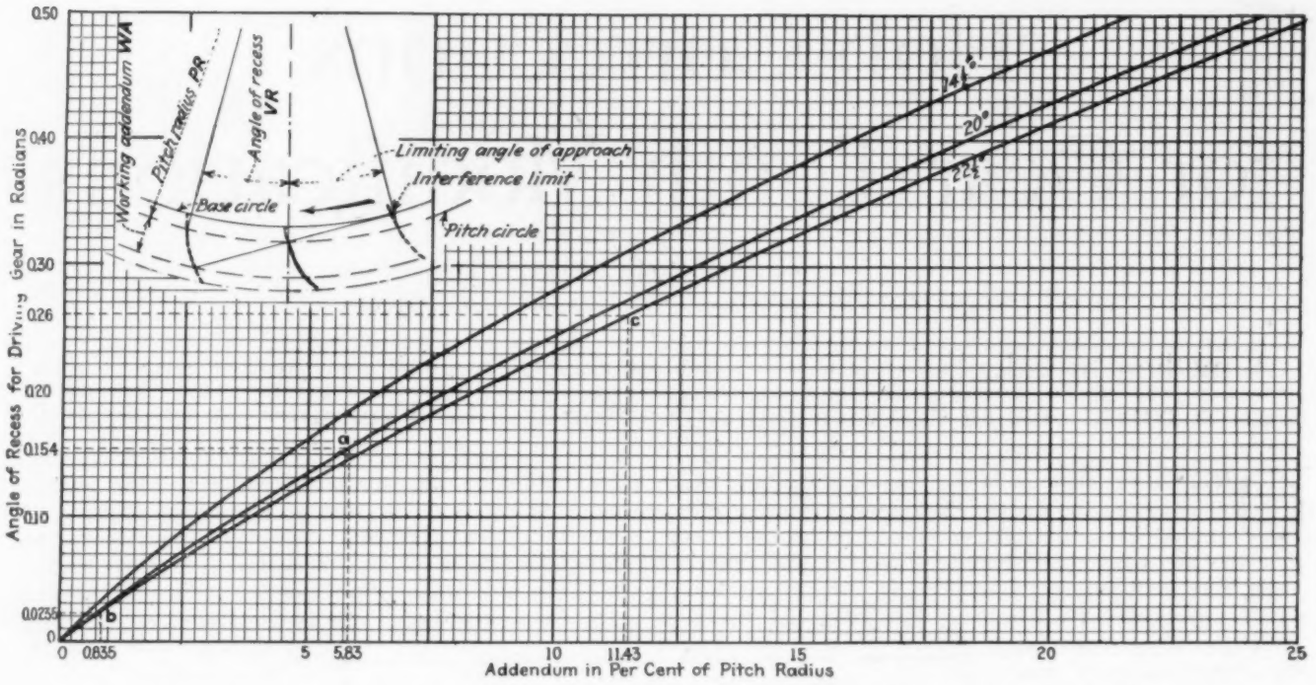


Fig. 10—Angle of recess for driving gear plotted against addendum in per cent of pitch radius

$$\text{Teeth in contact} = \frac{0.364 \times 4}{1.047} = 1.375$$

5. The number of teeth in contact in recess is the lower value of No. 3 and No. 4.

Teeth in contact in recess = 0.588

6–10. Repeat the above process for the driven gear, treating it as the driver. As the gears are alike, this will give the same result.

11. The total number of teeth in contact is the sum of the values found for the driving and driven gears.

Total teeth in contact = $2 \times 0.588 = 1.176$

In other words, two pairs of teeth are in contact 17.6 per cent of the time and one pair 82.4 per cent.

(F) A 100-tooth, 2-pitch, 22½-deg. pressure angle gear having its addendum 60 per cent of the module is to be cut with a hob on which the RWA is 0.100 in. and the correction angle is 24½ deg. This gear runs with a 20-tooth pinion whose addendum is 140 per cent of the module. What shape hob having a correction angle of 24½ deg. must be used in cutting the pinion if there are to be 1.2 teeth in contact?

The pitch-line correction on the hob is

$PLC = 0.200 \times (\tan 24\frac{1}{2} \text{ deg.} - \tan 22\frac{1}{2} \text{ deg.})$

$= 0.0083$ in.

The pitch-line correction on the gear in radians is

$$\frac{PLC}{PR} = \frac{0.0083}{25} = 0.000332$$

With reference to Fig. 7, the working addendum in per cent of pitch radius is given by point *a* in the upper diagram at 0.000332 radians and 0.835 per cent.

With reference to Fig. 10, the angle of recess, considering this gear as the driver, is given by point *b* on the 22½-deg. curve at 0.835 per cent and 0.0235 radians.

The teeth in contact in recess is given by

$$\frac{0.0235 \times 25}{1.5708} = 0.374$$

The teeth in contact in recess on the pinion, considering it as the driver, must be (1.2 — 0.374), or 0.826. The angle of recess on the pinion will be

$$\frac{0.826 \times 1.5708}{5} = 0.26 \text{ radians}$$

With reference to the 22½-deg. curve on Fig. 10, the addendum per cent of pitch radius on the pinion is found at *C*, which has 0.26 radians and 11.43 per cent for its co-ordinates. The working addendum on the pinion is then

$5 \times 0.1143 = 0.5715$ in.

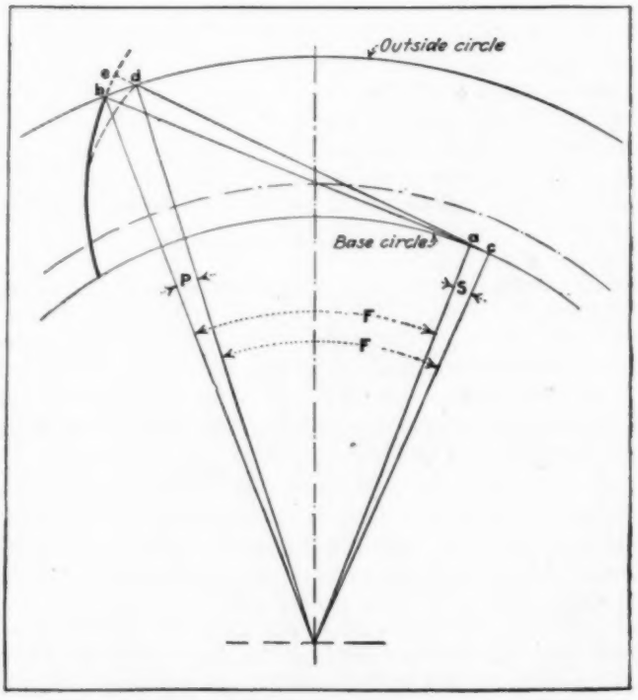


Fig. 11—Relation of the normal correction to the tip correction

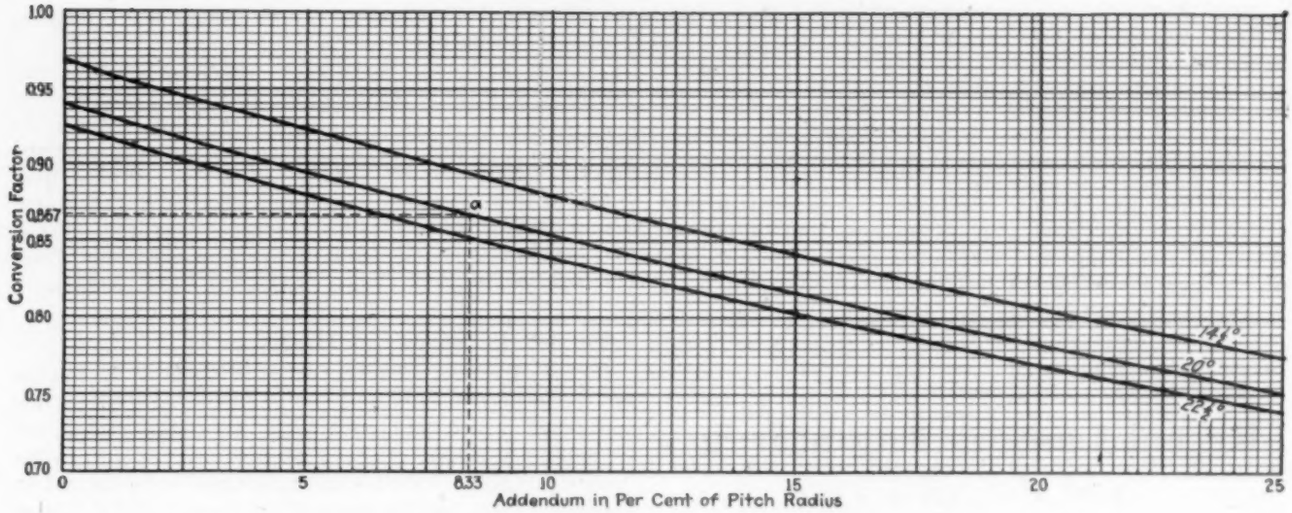


Fig. 12—Factors for converting circumferential tip correction to normal pitch correction

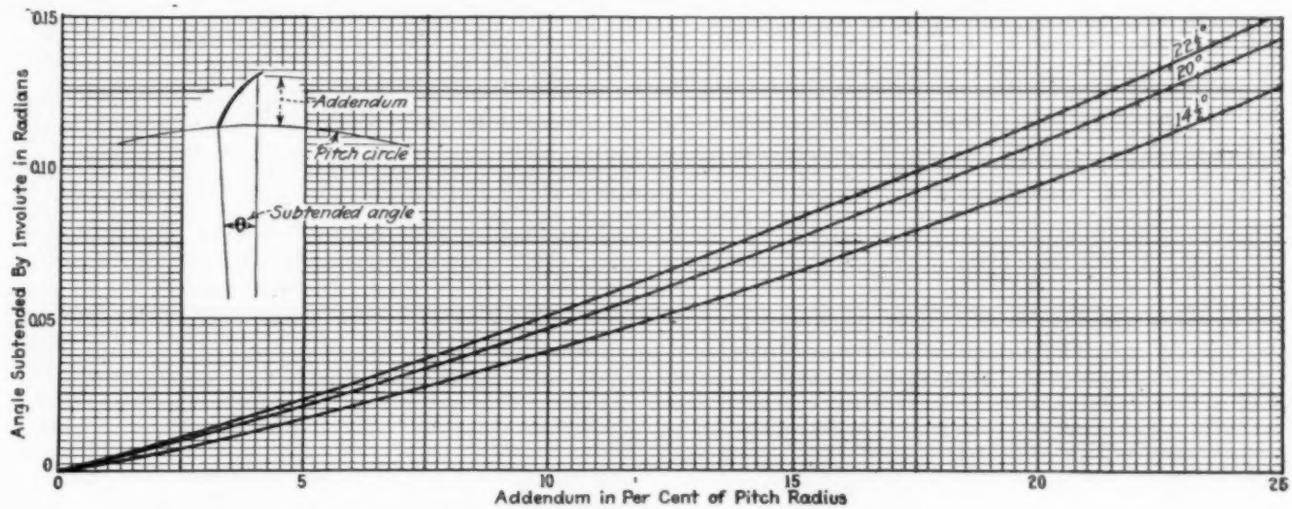


Fig. 13—Angle subtended by the involute for pressure angles of 14½, 20, and 22½ deg. in relation to addendum expressed in per cent of pitch radius

and the radial correction is 0.7 — 0.5715), or 0.1285 in.

The pitch-line correction in radians for the pinion is found on the 24½-deg. line of Fig. 7 at 11.43 per cent giving 0.0039 radians.

The pitch-line correction in inches on the hob tooth is then

$$PLC = 0.0039 \times 5 = 0.0195 \text{ in.}$$

The RWA on the hob is then given by the equation

$$RWA = \frac{0.0195}{\tan 24\frac{1}{2} - \tan 22\frac{1}{2}} = 0.470 \text{ in.}$$

The hob required for the pinion to give 1.2 teeth in contact will have the intersection point between the pressure and the correction lines 0.470 in. from the pitch line.

Normal Correction

Inasmuch as the chief reason for the use of tip relief is the fact that the normal pitch on one gear may be less in some places than that of its mate, it is sometimes desirable to calculate relief in terms of the normal correction rather than the tip correction. Furthermore, if a normal-pitch indicator is used, it is desirable to know how much this pitch is reduced at the tip of the tooth.

In Fig. 11 is shown an involute curve on which the tip correction TC and the normal correction NC are marked. The length ab equals cd and the angle P equals S. The normal correction is de which is equal to ac and the tip correction is bd. The ratio of the two then becomes

$$\frac{NC}{TC} = \frac{BR}{OR} = \cos F$$

or

$$NC = TC \cos F$$

The angle F was calculated in developing the tooth correction diagrams, so values of the cosine of this angle for the standard pressure angles were easily determined to plot against addendum per cent of pitch radius. In Fig. 12 these are given.

The use of these curves is illustrated by the following problem:

(G) Determine the normal correction on the gear tooth of problem B. The tip correction is 0.009 in. and the percentage addendum at the outside of the tooth is 8.33 per cent. The pressure angle is 20 deg.

On the 20-deg. curve of Fig. 12 mark the 8.33-deg.

point at *a*, and read the conversion factor at the left, the figure being 0.867. The normal correction then becomes

$$NC = 0.867 \times TC$$
$$= 0.867 \times 0.009 = 0.0078 \text{ in.}$$

INVOLUTE ANGLE

Values of the involute angle, as it is termed in this article, were calculated as a preliminary step in getting the correction diagrams. While no use is made of this information here, Fig. 13 giving this data under the title "Angle Subtended by Involute" is included because of its value in determining whether any given gear tooth will come to a point.

Recent Cases in Engineering and Patent Law

REVIEWED BY HERBERT BRAASCH
Attorney-at-Law

THE following paragraphs contain the substance of some court rulings on cases in mechanical engineering and patent law. Cases are taken only from the higher federal courts and from the state supreme courts. Legal terminology has been reduced to a minimum. Each case is designed to cover briefly all of the points essential to an understanding of the factors involved. Other "recent cases in mechanical engineering and patent law" will be published from time to time.

Exemption of "One Man Shop" Equipment in Bankruptcy

As a benefit of a state exemption "of tools or implements of a mechanic or artisan necessary to carry on his trade," an automobile body mechanic listed the following in his bankruptcy petition: One 12-in. joiner with 2-hp. motor attached; one 36-in. bandsaw connected up with ½-in. post drill; emery wheel driven by a 5-hp. motor; one countershaft with four pulleys and two hangers; one 3½-in. belt; one 2-in. belt; and two Wells Norris motor starting switches.

He submitted proof that he carried on his trade for himself without any employee for the four months prior to making his petition; that such equipment was the minimum required to carry on the trade for himself under present-day conditions; that such motor driven tools are part of the equipment of the ordinary body maker who carries on his trade for himself.

The court allowed the exemption stating that these were "one man" tools appropriate for use by one mechanic, and generally so used though power driven, and, like a lathe with motor attached, are exempt. There is nothing limiting a mechanic to hand tools, thus depriving him of the benefit of improvements in his craft. —*Dean vs. Shephard; Circuit Court of Appeals, Ninth Circuit.*

Status of Shop Supplies in Plant and Machinery Mortgage

On suspending operations the Apperson Automobile Company sold such items as tool steel, polishing wheels and brushes, and pattern lumber to the General Parts Corporation. These items were also claimed by the First Trust and Savings Bank which held a mortgage on the plant together with all buildings, machinery, tools and "apparatus" used by the Apperson Automobile Company. The General Parts Corporation claimed that the mortgage could apply only to the land and fixtures (manufacturing machinery).

It was held that "apparatus" in the mortgage was intended to include these items; also that there was no legal objection to agreeing that such items receive the treatment accorded to the machinery. In that case the Apperson Automobile Company had no saleable title. Some of this stock had been acquired after the mortgage was given, hence to this the mortgage was inapplicable, and General Parts Corporation got title.—*General Parts Corporation vs. First Trust & Saving Bank, Indiana.*

Trespasser Increasing Fire Hazard Liable

The T. L. Ross Lumber Co. piled some of its lumber on the adjacent land of the Williams Manufacturing Company, which had on former occasions complained of similar trespasses. Fire, of unknown origin, in the lumber company's yard was communicated to the manufacturing plant by the intervening lumber. The lumber company was held liable for the damage to the manufacturing plant.—*Ross vs. Williams Manufacturing Company; Court of Appeals, Georgia.*

War Confiscation and Trade Names

The Orenstein & Koppel Aktiengesellschaft maintained an American branch that was sold at the outbreak of war by the Alien Property Custodian. The business has since been carried on by the Koppel Industrial Car & Equipment Company.

The German manufacturer recently reëstablished an American branch in competition with this American firm, and the question arose as to the right of the German firm to use its name or the names of Koppel and Orenstein in the sale of these products of German manufacture. The German manufacturer was held to have such right, as he is not in the position of one adopting such name for the purpose of fraud or deceit. He must in some way distinguish the name used from that of his competitor to avoid confusion, and must add "not connected with Koppel Industrial Car & Equipment Company."—*Koppel Industrial Car & Equipment Co. vs. Orenstein & Koppel Aktiengesellschaft; Circuit Court of Appeals, Second Circuit.*

No Damages for Unascertainable Profits

Pumps, tanks, and service equipment were to be supplied and installed by the American Oil Company under contract with Robert Lovelace who leased a corner location. Lovelace was to sell only that oil company's products, and was to pay for the equipment from profits.

Because the pumps and tanks, when installed, would become part of the real estate removable only by the owners' consent, the oil company refused to carry out its contract unless the owner gave a signed permission to remove if Lovelace defaulfed. The owner refused. The court held the oil company liable to Lovelace for the damage he suffered. It refused allowance for loss of profit, because the item is unascertainable. The location was untried and might have been operated at a loss instead of at a profit.—*American Oil Company vs. Lovelace, Virginia.*

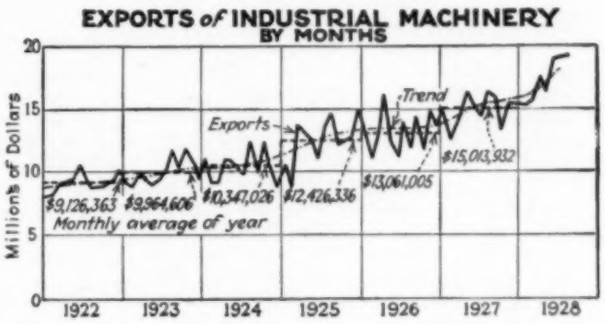
Forging dies generally have a draft or clearance of 7 deg. This is practically $\frac{1}{32}$ in. taper to each $\frac{1}{4}$ in. of depth.

Activity in the Metal-Working Industry

Operations Eighteen Per Cent Above Last Year

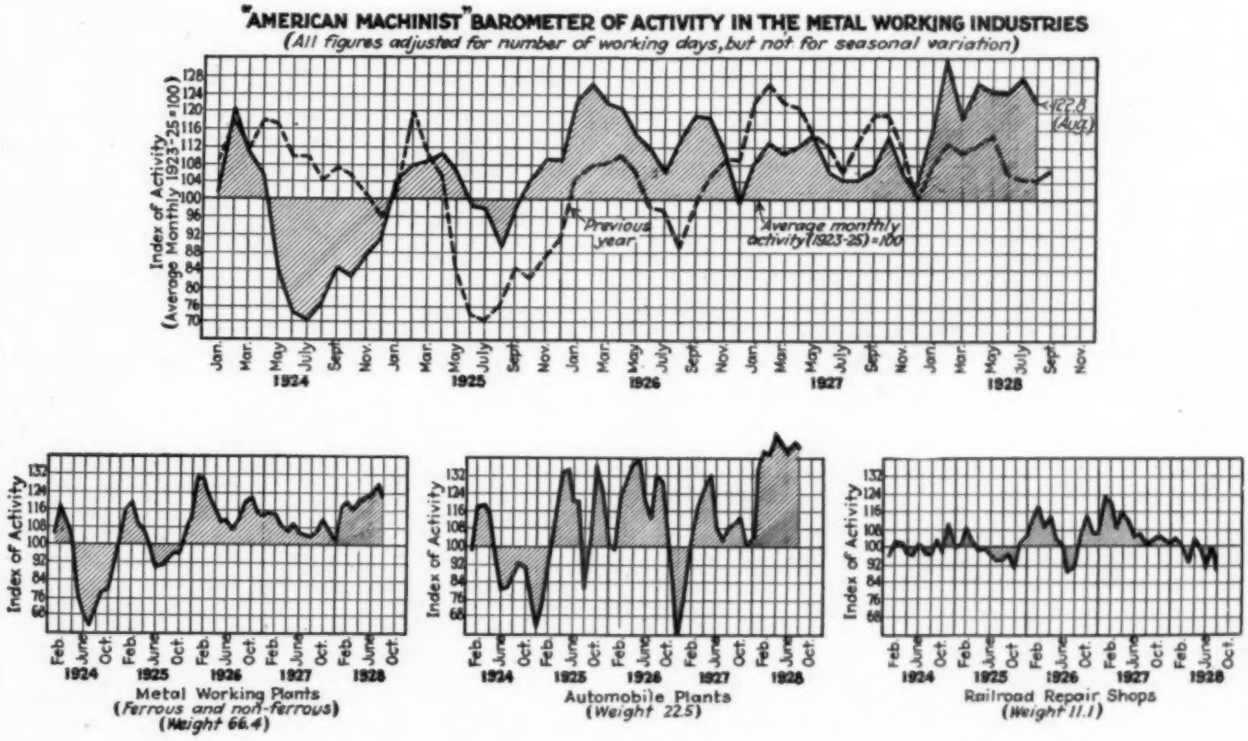
Preliminary data on the consumption of electrical energy indicate that the metal-working plants of the country were operating during August on a materially higher plane than during August of last year. The trend in rate of activity during the current August, however, was downward—3.7 per cent under July, whereas last year August operations were at approximately the same rate as in July. Notwithstanding this drop in activity during August, the rate of operations in the metal-working plants during that month were still about 18 per cent higher than those of August of last year. It would appear, therefore, that while the metal working plants are maintaining a comparatively high rate of activity, this activity apparently reached its current peak in July. The past eight months has been a record period for operations in these plants, the average rate of activity exceeding that for the same period last year by 14.5 per cent. There is every indication that the year 1928 as a whole will rank well above 1927 in average rate of activity.

The export shipments of industrial machinery have reached a new high level, according to figures announced by the Department of Commerce. Exports



totalled $19,193,156 for the month of July, as compared with $17,120,013 for July of last year. There was a noteworthy gain in the export of metal-working machinery, especially in the shipments of lathes and milling machines. The export trade in miscellaneous machinery also gained, the increases being distributed over a wide range of items.

The activity which has been apparent over a period of several months in the exportation of construction and conveying machinery is continuing, and the shipments for the first seven months of 1928 were 30 per cent ahead of the same period of last year.



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· TECHNICAL · ABSTRACTS ·

Managerial Understanding of Welding

Until the present time most managements have been inclined to leave to the workmen the responsibility for good welding. Although good results have been obtained, many are now asking the question, "How can I be sure that welds are properly made?" In an effort to obtain satisfactory knowledge, many managers are now submitting their operators to tests before they enter upon production work.

These qualifications in many cases are designed to duplicate so far as possible the conditions under which the welder will have to work in production. For example, if his work involves the use of steel plates, he should be required to weld a test plate under the observation of the welding foreman, who will note the operator's speed and technique. The test plate is then cut into strips which are preferably pulled in a tensile testing machine either at the plant or at some testing laboratory. Other strips of the test plate are placed in a vise with the weld flush with the jaws and sledged until the piece has bent to an angle of 90 deg. A satisfactory test specimen should not fracture under this test. The specimen is then reversed and sledged until it breaks. If it breaks through the weld, the fracture should show full penetration and thorough fusion without gas pockets, cold shuts, or other defects. It is also good practice to check the welder's ability at intervals during his employment.

Good Material Necessary

Although much emphasis has been placed on the human element in welding, as a matter of fact the welder is only one of the number of factors involved in making a satisfactory weld. It is of particular importance that he be supplied with good materials and welding equipment of standard make suitable for the work at hand. The manager should remember that chemical composition alone is no criterion of weldability. It is well to specify that the material should be free from appreciable quantities of non-metallic impurities and laminations, and it should be of good weldable quality. Furthermore, complete and effective utilization of the welding process is not possible unless the drafting room is familiar with designing for it.

In production work it is important to provide suitable means for holding the work during the welding operation. This includes various types of supports, jigs and clamps for lining up and spacing seams for welding.

There are many details of welding technique that ought not to be left to the judgment of the individual operator, but should be determined in advance by the management. Tip sizes and pressures of oxygen and acetylene should be adjusted in accordance with the manufacturer's chart, and the operator should not be allowed to change these at any time.—*Oxy-Acetylene Tips,* August.

Aluminum Casting Alloys

Pure aluminum is used only to a limited extent in the casting industries as its properties are not such as to lend themselves to structural uses. The tensile strength is about 12,000 or 13,000 lb. per sq.in., and elongation on the order of 25 per cent. However, these properties can be changed considerably by varying the methods of casting and by varying the purity of the aluminum.

Of the these alloys there are only three types which are used to any considerable extent. These are aluminum-copper, aluminum-manganese, and aluminum-silicon alloys. Most of the alloys of commerce are ternary alloys or even contain four or more elements, but their bases are, as a rule, aluminum and copper or aluminum and silicon. One alloy, aluminum-manganese, is quite an important binary alloy. When about 1.1 per cent of manganese is added to commercially pure aluminum, the tensile strength is substantially increased and the other properties are sufficiently near the properties of commercially pure aluminum so that this alloy can be substituted for the latter in most cases. Furthermore, the manganese does not detract from the corrosion-resisting properties of nearly pure aluminum. This, however, is used to a slight extent in the castings industry. Two alloys are more used for sand casting purposes than any others. These are Nos. 12 and 112, or S.A.E. Nos. 30 and 33. The No. 12 contains 8 per cent copper, has an ultimate tensile strength from 18,000 to 23,000 lb. per sq.in., elongation in 2 in. of 1 to 3 per cent, approximate yield point of 10,000 lb. per sq.in., and Brinell hardness No. 65. No. 112 contains 7.5 per cent copper and 1.5 per cent zinc, and 1.2 per cent iron. The ultimate tensile strength is from 19,000 to 24,000 lb. per sq.in., elongation 1 to 2½ per cent in 2 in., approximate yield point 11,000 lb. per sq.in., and Brinell hardness No. 65. It will be seen that the addition of these alloying materials has raised the properties considerably above those of pure aluminum.

Another aluminum-copper alloy containing about 4 per cent of copper is used especially where leak-proof characteristics are desired, and also where more hardness is desired than obtains in the other two alloys. This alloy is somewhat more brittle than the 8 per cent copper alloys, and for that reason is not as good for structural casting purposes.—Zay Jeffries, *Mechanical Engineering,* September.

Cost of Accidents Due to Poor Illumination

It has been said that the total annual accident bill in the United States exceeds $12,500,000,000, and that the annual direct cost of medical fees, hospital charges, and compensation payments required by the various states is $2,500,000,000. It has been the experience of the Travelers' Insurance Company, that 15 per cent of our industrial accidents result from poor lighting. If we take 15 per cent of the $12,500,000,000 for direct and hidden expenses of accidents as the cost of accidents resulting from poor lighting and defective vision, we find that American industry is paying $1,875,000,000 annually—a sum in excess of the entire income of all the electric light and power companies in the country.

Correct Lighting Important

It has been found that under normal conditions, 25 per cent of our physical energy is exerted in seeing things, making use of our sense of sight; 70 per cent of our muscular actions are in response to impressions gained through our sense of sight; two-thirds of our workers have defective vision to an extent that requires them to expend more than 25 per cent of their energy to approximate normal vision under good lighting conditions; there are practically no shops having perfect illumination according to our present standards. The harmful possibilities of these unsatisfactory conditions may be realized when we remember that the sense of sight is man's greatest safeguard. Corrective measures may be taken with respect to methods of operation and the installation of guards and safety devices, but the possibility of accidents will remain, so long as the improper lighting of the workplace and the defective vision of the worker are disregarded.

Consider the following incident. A large machine was damaged by a heavy casting which was being transported by an overhead crane. It was demonstrated that the crane operator was unable to see the obstruction which caused the accident. The total cost of the accident was in excess of $30,000, including all the direct and hidden costs. By making the proper changes in the illumination system, the extra cost of power did not exceed $80 per month. The hidden cost of accident bill was sufficient to pay the increased cost of lighting for 32 years. Which would you prefer to do, pay large damages for one accident or provide proper illumination for a period of years at the same cost?—*The Travelers Standard,* September.

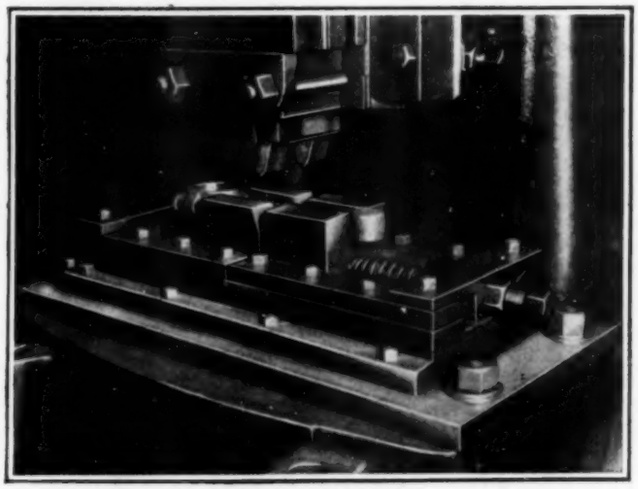
IDEAS · FROM · PRACTICAL · MEN

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Testing Connecting Rods for Cracks

By F. W. Curtis

An unusual inspection device is employed in the shops of the Nash Motor Company, Kenosha, Wis. It is shown herewith, and is for detecting cracks or flaws in connecting rod forgings. The device is mounted on a No. 4 Bliss press, and consists of a base with two spring-backed jaws that hold the rod by the two ends. When the V-shaped punches descend they spread the jaw blocks and stretch the rod approximately 0.020 in. This amount of elongation has no detrimental effect on a sound forging. But if there exists any crack too small to be seen by the naked eye, it is opened up so as to be readily visible. By changing the jaw blocks to suit the length of rod, various sizes can be tested in the same press.



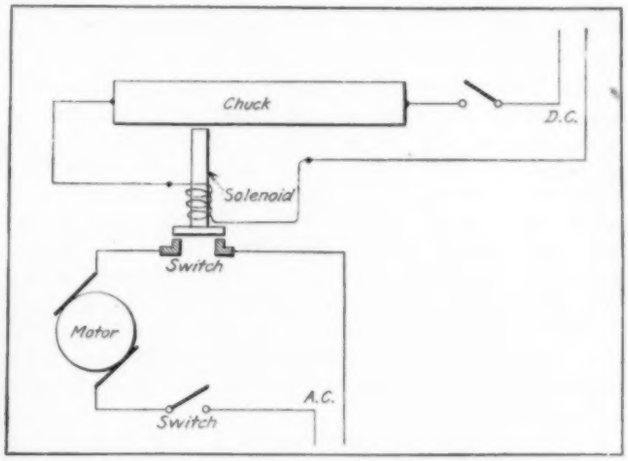
Detecting cracks by stretching the rod

A Safety Arrangement for the Magnetic Chuck

By R. H. Kasper

Occasionally, in operating a surface grinder equipped with a magnetic chuck, the operator forgets to close the switch controlling the current for the chuck. The result is that when the work table is started, the work is thrown out with considerable force. If the work is small, it will usually roll over, resulting in a broken wheel, a bent spindle or an injured workman.

By means of a simple electrical hook-up, as shown in the sketch, an accident of this kind will be avoided, as the direct current furnished the magnetic chuck controls the alternating current which operates the motor.



Safety circuit for magnetic chuck

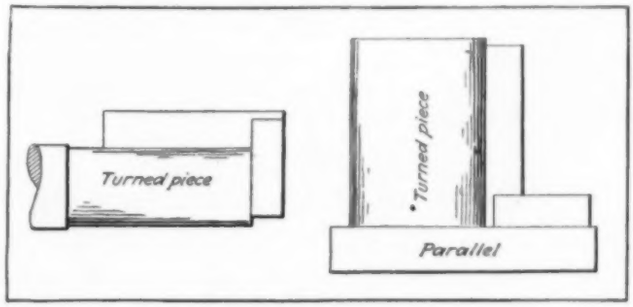
In the d.c. line, in addition to the switch which controls the chuck, a solenoid is installed, which is actuated when the circuit is closed. In the a.c. line, feeding the motor, a switch is installed, which is operated by the solenoid in the d.c. line. Thus it will be impossible to close the circuit in the motor line until the circuit in the d.c. line is closed and the chuck is holding the work. The usual type of starting switch is installed in the motor line in addition to the solenoid actuated switch, so that the work may be held to the chuck before the motor is started.

A Simple Set-Up for Testing the Accuracy of a Square—*Discussion*

By F. M. A'Hearn

The article by James McIntyre, under the title given above, published on page 32, Vol. 69, of the *American Machinist*, brings to memory a method of testing a square taught me when I was an apprentice.

As shown in the illustration, the test block is a piece



Methods of testing squares

of turned stock having the end faced. It is not essential that the test block be turned on centers, although such a block, with the central area undercut, makes a very good one. Some mechanics used a chucked piece, such as a bushing, having the end faced, and the outer diameter turned parallel. Obviously, an error on one side of the test piece is one-half of the variation in its diameter. Such an error, when the test block is turned by a skilled lathe-hand, may be disregarded in everyday shop practice.

Apprentices, for reasons of economy, as well as for pride in their ability in shop work, sometimes made tools, such as squares, calipers, and surface gages. The blades of the squares were made at an angle slightly less than 90 deg. By checking the inside of the blade against a turned piece and working down the outer end of the blade, the entire length of the blade could be squared up without the removal of material at its junction with the stock.

In testing the outside of the blade, a turned piece was placed on a plane surface. The outside edge of the blade was brought against the turned surface, or tested by use of feelers, which may be used in testing either edge of the blade. It is almost needless to add that both the blade and the stock of the square must be parallel when finished. An advantage of the turned test-block is that it can be easily obtained in the machine shop or toolroom.

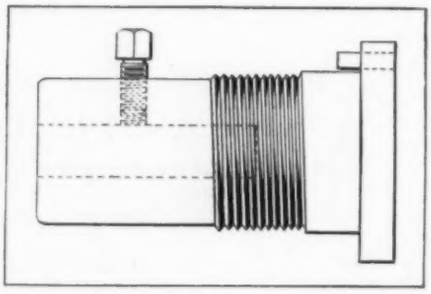
A Splining Tool for the Shaper

Discussion

By Otto A. Wagner

The article by R. Cowan under the title given above, on page 1058, Vol. 68, of the *American Machinist*, reminds me of a toolholder I made for the same purpose, and which is shown in the accompanying sketch.

While the tool described by Mr. Cowan is for cutting splines in comparatively large holes, my holder can be used with tools for holes of small sizes. In fact the smallness of the tools is limited only by their ability to stand up under the cut. A pin in the flange of the holder fits a hole in the clapper and keeps the holder from turning when tightening the retaining unit.



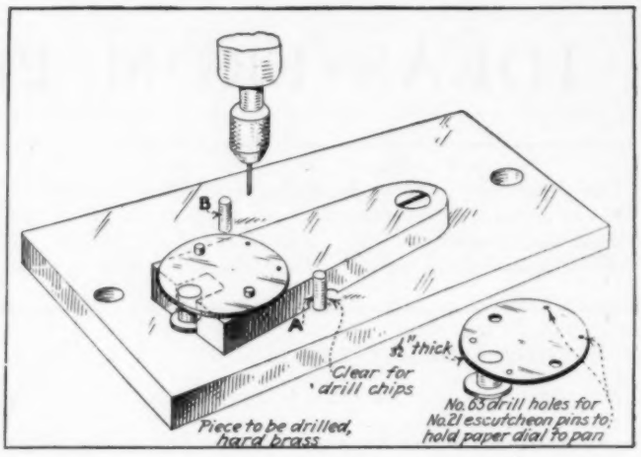
A holder for shaper splining-tools

A setscrew through the side of the clapper box holds the clapper down, thus permitting the tool to cut upward, downward or sidewise without danger of riding, or of being caught in the work on the return stroke.

Drilling Small Holes in an Open Jig

By C. H. Willey

We recently solved a troublesome item in our small drilling department with a change in our method of drilling by jigs. In the manufacture of meters we use many thousands of hard brass dial pans, the dial pan also serving as one of the flanges of the spool on which the resistance wire is wound. The dial pans are punched in the press with size No. 31 drill holes in them and holes for 2-56 screws for the meter bridges. But it is impossible to punch the No. 63 holes that are used to pin the paper dial to the pan on its outer edge, so we have been drilling them on the old-fashioned jigs, that is, placing each on the jig laid out as desired and drilling through hardened bushings.


B
A
Clear for drill chips
Piece to be drilled, hard brass
No. 63 drill holes for No. 21 escutcheon pins to hold paper dial to pan

An open drilling jig for small holes

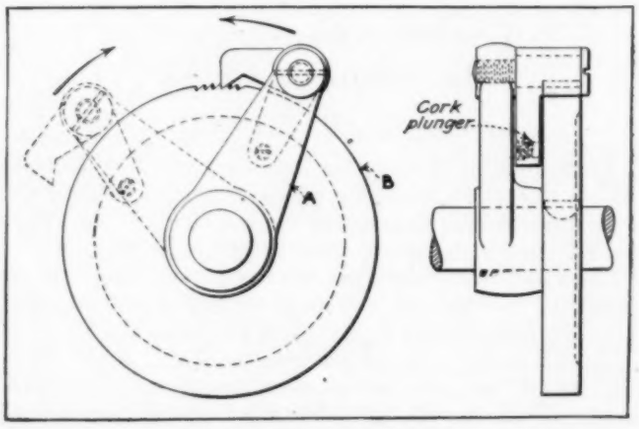
A No. 63 drill is very delicate and when it fills with chips in a drill jig bushing it breaks or twists off easily. One of our toolmakers solved the problem by the design of an open drilling jig, as shown in the sketch. A pivoted piece swinging from one post *A* to the other post *B* gives us the two desired holes under a free drill. Production was increased 40 per cent, and drill breakage reduced considerably.

Pawl Designed for Silent Operation

By Charles Brau

In a machine that I designed recently, part of the mechanism was operated by a ratchet and a pawl. Since it was desired to have the machine operate as noiselessly as possible, I designed the silent pawl shown in the illustration.

The pawl is in the shape of a bell crank, one end of which engages the ratchet teeth while the other end carries a spring plunger made of cork. The plunger bears against the side of the ratchet wheel, creating friction



A silent operating ratchet and pawl

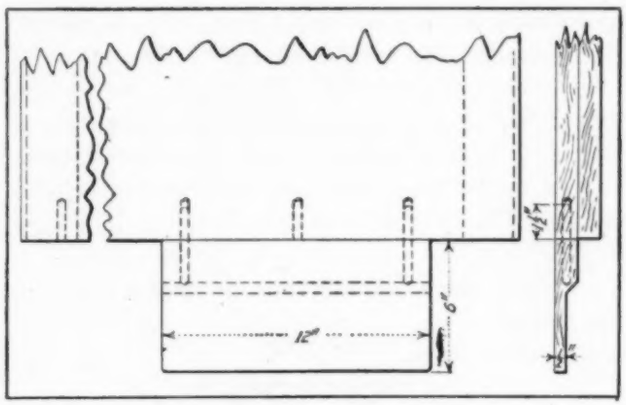
as the pawl travels. When the lever *A* moves counter clockwise, the friction of the cork plunger *B* brings the pawl into engagement with the teeth of the ratchet wheel and causes the wheel to rotate. On the return stroke the friction of the cork plunger on the side of the ratchet wheel lifts the pawl out over the ratchet teeth to the position shown by the dotted lines.

An Arm Rest for the Draftsman

By J. E. Fenno

Sometimes it is necessary to locate a drawing very close to the lower edge of the drawing board. In such cases, if much freehand work is to be done, the draftman's arm will soon become cramped and tired because it has no support.

A simple scheme to provide an arm rest is shown in



An arm rest for the draftsman

the illustration. An auxiliary board is attached to the lower edge of the drawing board by two long dowels. Holes are drilled in the edge of the drawing board at intervals, so that the auxiliary board can be placed in any convenient location. The dowels are fastened in the auxiliary board and are a push fit in the holes in the drawing board.

Adjustable Spacers for the Lathe Chuck—*Discussion*

By C. Kugler

In the *American Machinist,* page 290, Vol. 69, Henry Simon in reply to my devices on the above subject makes some statements which are not in accord with my 32 years of shop experience. It is true, as he says, that my three bolts cannot be used for work smaller in diameter than the hole in chuck, but I have never found it necessary to use supports for work so small in diameter. He says that much of the larger work can be held by reversing the jaws and using the steps. They can, but do the chuck jaws run true? They never have in my experience, any that is why I can use either of my devices when two surfaces must be machined parallel to each other.

I cannot agree with him when he says my bolts will fall short of being applicable in 90 per cent of the cases. My adjustable spacers are made of cast iron, and the machine work required is only the drilling and tapping of the hole for the bolt and the machining of the flat side. These are kept in the tool crib and can be had for a tool check, the same as a drill or reamer.

The cost of a pattern for his device is higher than for mine. The size of holes in chucks vary. Therefore, Mr. Simon's device cannot be universally applied to any chuck, and be centered automatically and kept from sliding. My adjustable blocks can be applied to almost any chuck. He claims that a single spacer can be made to handle any job within the capacity of the chuck. Suppose we have a ring 18-in. outside diameter, and 16-in. hole, 1 in. thick, which is a common job in our shop. Mr. Simon's device would be of no use in this case unless he makes one so large that it would cost more than the job. His device is loose in the hole, and he cannot face it off in place. It will not produce work that is any more accurate than the practice of placing a parallel between the work and the face of the chuck and then tightening the jaws on the work.

Tools for Turning Balls in a Drill Press—*Discussion*

By Chas. S. Hazard

On page 249, Vol. 69, of the *American Machinist,* R. G. Hewitt describes a machine for turning balls which is more elaborate than mine, but will produce more accurate work. Mr. Hewitt's toolpost is particularly good in that the large diameter bearing surfaces will steady the tool, and prevent it from jumping ahead due to backlash in the gearing.

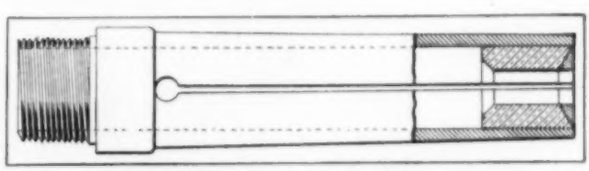
We have used a similar design on semi-automatic machines, in which the tool is fed automatically. Our experience with these machines, however, has been that a spur-gear or bevel-gear drive, such as Mr. Hewitt uses, does not produce the best finish on the work, for any inexactness in the tooth form of the gears will vary the feed of the tool enough to show parallel lines on the finished surface. These lines are particularly evident when using diamond tools. When the finish is "fussy," we make it a practice to use worm drives at every possible point in the feed mechanism.

Bronze-Bushed Feeding Fingers for the Automatic

By J. F. Taylor

We make large quantities of parts from piston finish cold-rolled steel in our Brown & Sharpe automatic screw machines, and were troubled with scratches made on the stock by the feeding fingers of the machines.

In an effort to remedy the trouble, we made new fingers in which the holes were ground and lapped, but



Feeding fingers bushed with bronze

they failed to stop the scratches. We then made some fingers and bushed them with bronze as per the illustration. The bushings were brazed in the fingers before being split. Since using the bushed fingers, the scratching has been entirely eliminated.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Opportunity in Unusual Fields

LARGE, modern plants are apt to give the impression that little remains for the young engineer to do, that opportunities for vital improvements are few and far between. For it is not easy to realize that thoroughly modern plants are the exception rather than the rule, even in the most advanced industries.

Outside of these industries there are still many more opportunities left. A recent visit to a plant where sardines are canned in large quantities revealed many opportunities for the introduction of labor-saving machinery. Conveyors were used to a limited extent but the only really automatic machinery was that for closing the cans after packing. The heads and tails of the fish were cut off by hand with ordinary shears and many more automatic conveying and handling devices could have been used to advantage. No engineer need ask for a better opportunity for reducing costs than was presented in this plant.

There are doubtless equally good opportunities in many other lines of industry. And it is quite probable that a study of some of the industries that now complain of little or no profit will reveal a condition similar to the one just cited. A search for such unusual opportunities should result in many profitable contracts.

Are Production Men Driven Too Hard?

SPEND a day, or a week, with any busy production executive, and you will probably come away convinced that he has too much to do. Ask the administrative head what he thinks about it, and he will probably tell you that production men like to be that way, that they are unhappy if they are not doing three things at once, and that there is no help for the situation anyway.

Which may all be true, but is it a safe situation to be permitted to continue?

A striking evidence of how far this thing has gone is found in the technical and trade literature. The publishers and editors, through their contacts with the field, have sensed the situation and are bending every effort to present ideas to their production readers in attractive, condensed, easily grasped guise. Many more photographs are used than was the case only a few years back. Short articles predominate. All of which is in answer to the plea made by production men in every field that they are too busy to read.

Men in corresponding positions in the civil engineering and construction field, or in the public utilities, apparently are not driven so hard, for they welcome a longer and more comprehensive treatment of the material prepared for them by the editors of journals in their respective fields.

It would be hard to prove that the civil and electrical engineers are doing a better job than their mechanical colleagues because they have more time to read technical literature, to digest it and to do unhurried thinking, but it is at least reasonable to assert that those responsible for the extent to which production men are being driven owe it to these men and to their own stockholders to find out whether this driving is impairing efficiency. They should not forget that it is a very expensive task to replace a valuable production man when overwork kills him or drives him into retirement.

First Impressions

THERE is a trite old saying that first impressions are best. Love at first sight, it is true, seems far removed from metal working, yet there is a moral that applies. A sentence in the attractive English catalog of a Berlin machine tool builder brings out the point.

The sentence reads, "A car is at your disposal to convey you to our works and back again to town." There are companies in the United States where a similar courtesy is extended, but not many. And most of the others could profit by following the example of this German company.

When factories were located near the center of town the problem of getting to and from them was a small one. Visitors usually walked the two or three blocks from the hotel or the railroad station, and thought nothing of it. But with plants being moved farther and farther into the outskirts the story is a different one. Even the affluent object to taxi bills that run to four or five dollars, and the sweetest disposition is likely to suffer from an hour on a street car, followed by ten or a dozen blocks on foot.

Contrast the feelings of such a one with those of the visitor who has been met by a comfortable car, and you will realize what a difference first impressions can make.

Defiance Special Multiple-Spindle, Fixed-Center, Two-way Drilling Machines

TWO types of this two-way drilling machine have been placed on the market by the Defiance Machine Works, Defiance, Ohio. These are a horizontal right-angle machine and a horizontal opposed machine. The former is shown in the illustration. It is adapted to production drilling of transmission cases, motor blocks, and similar work, and is suitable for drilling all holes in the ends and bottom. Of course the horizontal two-way opposed machine is suitable for drilling only two opposite faces.

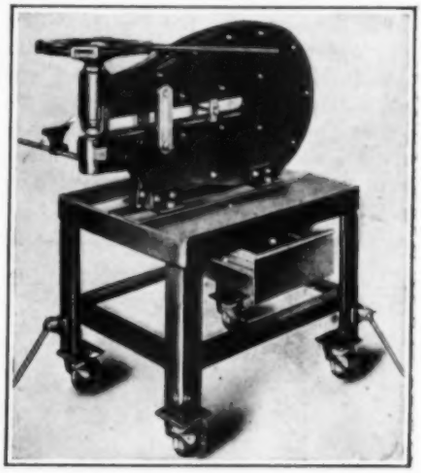
Both machines have heavy box-type bases having broad, deep ways, on which the heads slide. The multiple-spindle heads are fitted with alloy steel spindles which run in Timken roller bearings. The spindles are driven by stub-tooth, heat-treated gears which are inclosed and continuously oiled by force-feed lubrication. Spindle bearings can be made of Navy bronze if desired. The right-hand head of the angle machine has 12 spindles which are driven by a 7½-hp. motor running at 1,150 r.p.m. The left-hand head has 39 spindles driven by a 10-hp. motor running at 1,150 r.p.m. Motors are direct-connected to the heads with flexible couplings. The right-hand head of the horizontal opposed machine has 36 spindles, and the left-hand head has 31 spindles. Both machines are equipped with a heavy fixture which has a hardened plate and locating pins for centering. A roller conveyor table on each raises the pieces and has an eccentric which forms a stripper for raising work off the pins. A roller conveyor is provided for removing the work. A heavy jig plate is mounted on each side of the fixture, and is fitted with removable jig eyes for guiding the drills.

Oilgear feed is used on both machines. The cylinders are mounted in the base under the heads. The angle machine has a 16-in. stroke for each head, while the horizontal opposed machine has an 1-in. stroke for each head. Both have rapid traverse forward which changes to the rate of speed desired while cutting. An automatic kick-off and automatic return movement are provided. The heads are equalized with a cut steel rack and pinion. In each case the Oilgear pump is driven by a 3-hp. motor running at a speed of 860 r.p.m. Production is quoted at one drilled case every 2 min., including time for drilling, loading, and unloading the machine. Either machine can be fitted with mechanical screw feed instead of with the Oilgear.

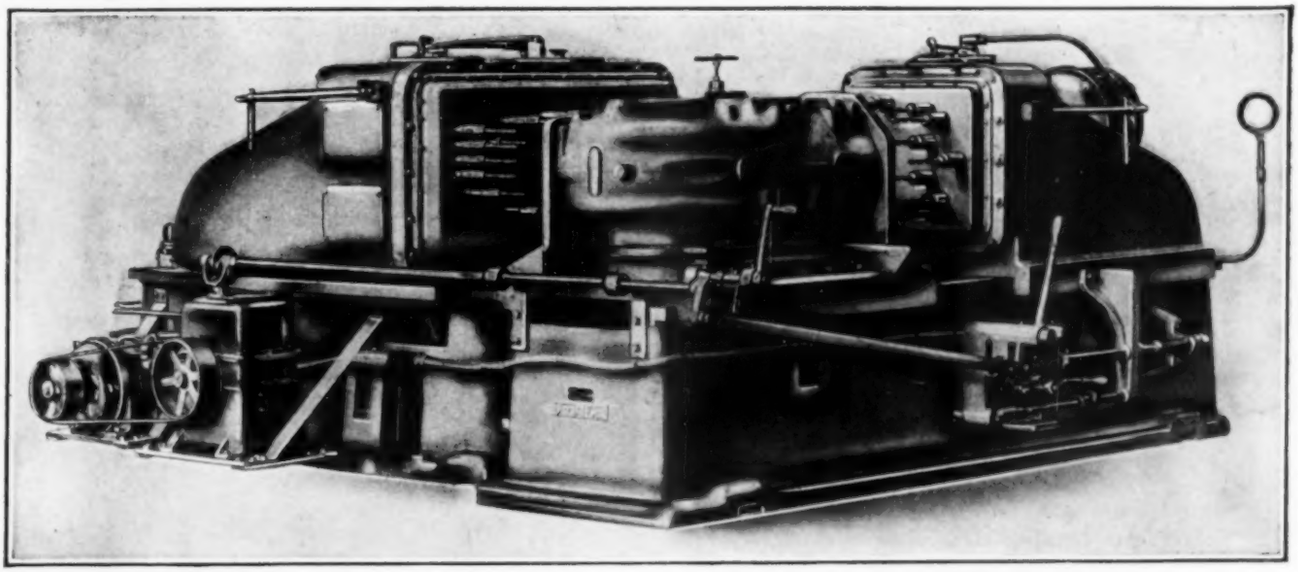
The floor space occupied by the right-angle machine is 138x132 in., while that of the horizontally-opposed machine is 180x64 in. The weights are 18,700 and 19,580 lb., respectively.

Whitney Nos. 26 and 27 Truck-Mounted Deep-Throat Presses

Both the Nos. 26 and 27 deep-throat presses are mounted upon small truck-type bases. The presses have been introduced by the Whitney Metal Tool Company, Rockford, Ill.



Whitney Truck-Mounted Deep-Throat Press



Defiance Special Multiple-Spindle, Fixed-Center, Horizontal, Right-Angle, Two-Way Drilling Machine

The No. 26 has an 18-in. throat depth, while the depth of throat of the No. 27 is 24 in. The capacity of the No. 26 is a 2-in. hole through $\frac{3}{32}$-in. sheet steel, while that of the No. 27 is a 2-in. hole through No. 16 gage. Both machines are equipped regularly as shown with side tierod plates, and when these plates are in position the machines have capacity to punch $\frac{1}{2}$-in. holes through $\frac{3}{8}$-in. iron with 7-in. throat clearance.

The dieholder is of such construction that bolster plates may be furnished when special dies are required. A solid punch coupler can be used for holes up to 1 in., but over this size a split coupler is required, although it can be used for all sizes if desired. A handwheel is furnished on both presses for actuating the dies. It has four positions for the insertion of a short lever for punching heavy materials. Two gages are furnished with each machine, one for depth and the other a side gage. Each gage may be used to make duplicate pieces without center location. The punches have self-centering points.

The trucks are made of 3x3x$\frac{1}{4}$-in. angle iron and are supplied with steel drawers. They are mounted upon ball bearing swivel casters 4 in. in diam. As shown in the illustration, sharpened braces are hinged to each leg of the truck. When it is desired to move the machine, these braces can be lifted up out of the way.

National 365,000-Pound Forging Machine

HOT forgings, requiring little machining, can be produced by the internal displacement method on this 365,000-lb. forging machine which has been developed by the National Machinery Company, Tiffin, Ohio. All straight carbon and alloy steels can be forged by the process of progressive deep piercing. The stock is heated to the same temperature as in other forging work. It must equal in cross-section the cross-sectional area of the completed piece, and sufficient free space must be supplied in the die to accommodate stock displaced by the piercers. After upsetting, progressive dies force the stock into the finished shape. Piercing is accomplished with but one-fourth of the pressure since the stock is merely spread, not severed. It will be noted that the blank is progressively sheared so that the resulting end will be square. As the process progresses, a piercer is supported in the impression made by the previous one.

Pieces 14 in. in length, having an external diameter of $8\frac{1}{4}$ in., have been produced. Automobile transmission and differential gears made by this method, as shown in Fig. 3, have but from $\frac{1}{32}$ to $\frac{1}{16}$ in. of stock to be removed. Piercing the holes leaves but 0.020 in. on a side to be removed by a broach. As an example of the accuracy to which successive pieces can be held, ball and roller bearing races 3 in. in diam. varied only 0.10 in. in diam. The size of the machine shown in Fig. 1 may be comprehended

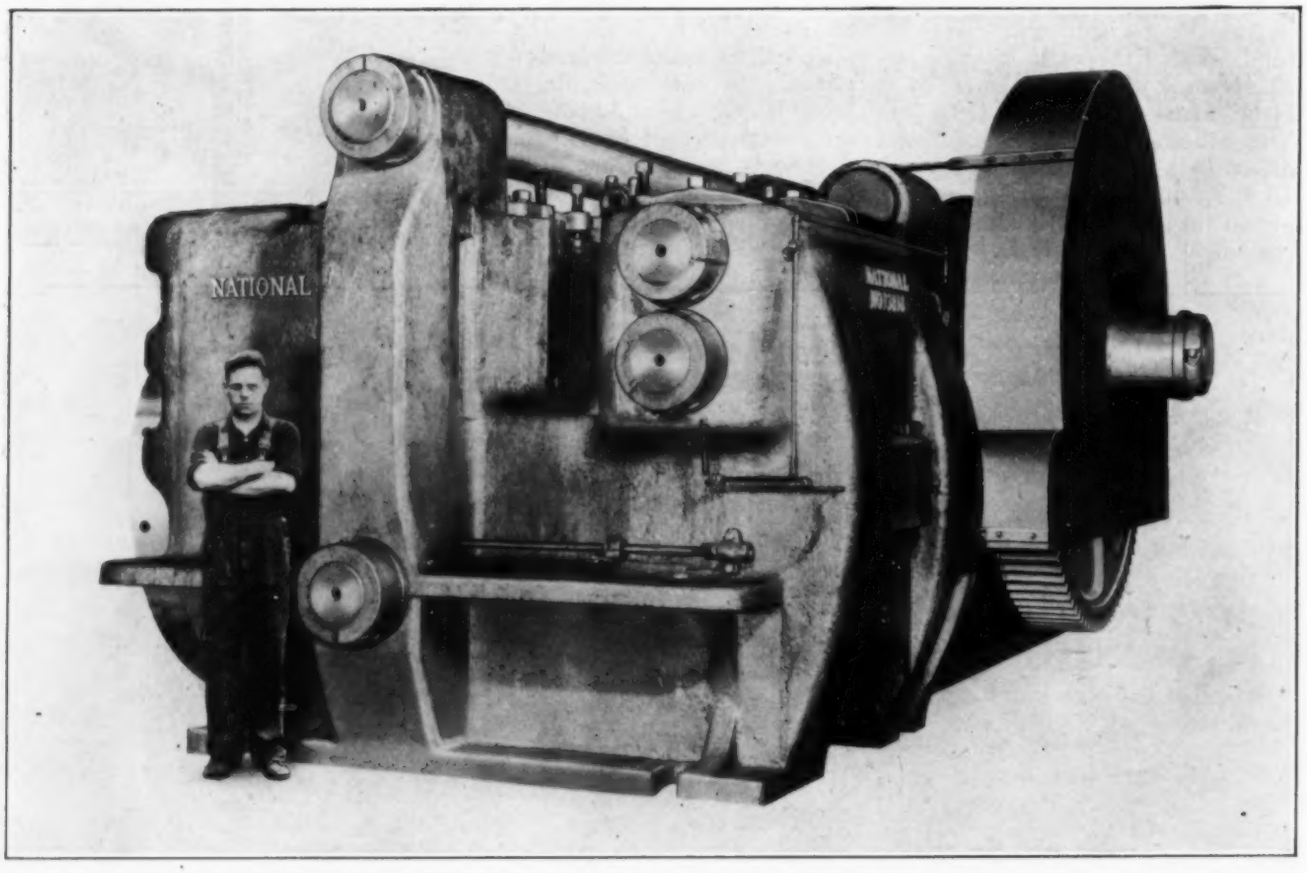


Fig. 1—National 365,000-Pound Forging Machine. Note that it is intended to be placed in a pit

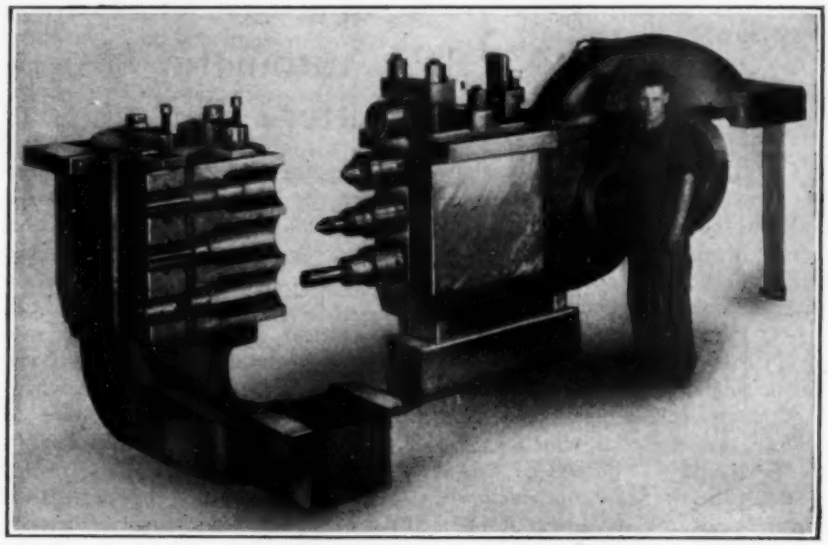


Fig. 2—Heading and gripping slides showing their outboard bearing construction

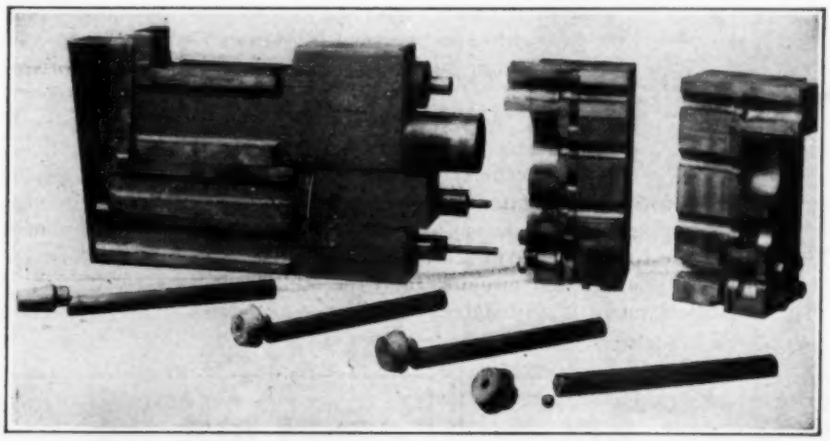


Fig. 3—Note the small slug which is the only waste in making this differential gear

when it is compared with the man. The portion up to the gear guard is intended to be placed below the floor line.

No flash is produced on hot forgings made in this machine. This is due to the massive construction of the bed, which eliminates springing and also to the heading and gripping slides shown in Fig. 2. The bed is compact in design and is strengthened by heavy ribbing. In addition, massive tierods are located at the top to take the tensile stresses. Great length of the heading slide is provided by the overarm construction which extends over and beyond the crank shaft. This extra length permits accurate movement of the heading slide. The same type of construction is applied to the gripping slide which carries the moving die. The long outboard support secures close registration of the die impressions. Thus the dies are kept closed against the hydraulic action of the heading tools on the hot stock. Usually the piece is made in three operations, through successive forming dies. No squirting of hot metal can occur as the edges of the dies are in close contact. A foot-operated air trip starts the machine. To obtain fast operation, a four-segment clutch is used.

Wagner Ball and Sleeve Bearing Construction for Motors

Ball and sleeve bearings of improved design are being used on motors made by the Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo. All horizontal motors made by this company, with the exception of air-jacketed and high-speed motors, are available with sleeve bearing construction. Fig. 1 shows this type on the commutator end of a slip-ring motor. This bearing is of the double-ring type, and is placed in a one-piece oil well which holds a large quantity of lubricant to radiate heat rapidly. The oil grooves run both laterally and circumferentially to distribute oil uniformly over the bearing surface. End grooves gather excess lubricant and return it to the well through drain holes in the bottom of the grooves. The babbitt lining is dove-tailed into the cast-iron bearing shell. The dust cap seals the end of the housing against oil leakage. An oil slinger on the thrust collar prevents oil from passing into the motor. Oil rings of one-piece construction are kept in place by guards. The center plug is at the oil level.

In Fig. 2 is shown a ball bearing in position in an assembled motor. This bearing is of the "double cap" type since the ball bearing is housed between two caps securely bolted together. This construction facilitates

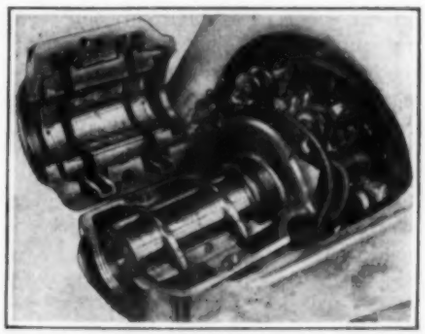


Fig. 1—Double-ring sleeve bearing on a Wagner slip-ring motor

bearing replacement or servicing, and makes it possible to remove or assemble ball bearings in dust-laden atmospheres without danger of injurious foreign matter getting into them. A suitable fit is provided between the outer race and bearing housing so that the outer race is permitted to "creep" or rotate slowly, and thus distribute stresses uniformly. To hold the inner race firmly in place on the shaft and yet permit easy removal, a slight "shrink" fit is used, together with a clamping nut and lock washer.

In Fig. 3 are shown the bearings for

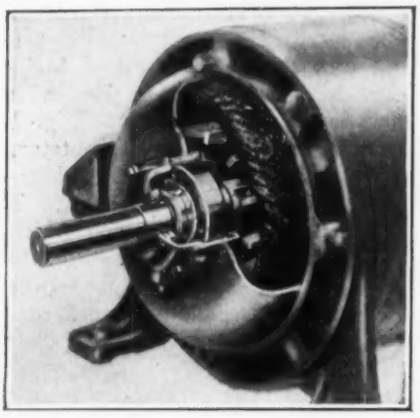


Fig. 2—End frame cut away to show ball bearing construction of Wagner motor

the front and pulley ends of a motor. A single-row, deep-groove bearing takes the thrust load at the front end, while a double-row, self-aligning bearing, or equivalent deep-groove bearing, is used on the pulley end with the outer race free to adjust itself to variations in the shaft length due to temperature changes. Precautions against the leakage of lubricant or entrance of dirt are embodied in the design of the inclosing caps. Gaskets prevent leakage between caps and motor frame, and a series of grooves keeps lubricant from creeping out of the housing and along the shaft. A drain-back hole on the inside groove returns excess lubricant

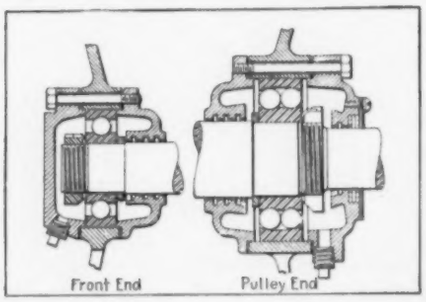


Fig. 3—Cross-sections of ball bearings used on front and pulley ends of Wagner motor

to the well. Felt washers held by metal washers provide an additional safeguard against extreme dirt conditions. Drain holes, tightly closed by plugs, facilitate flushing the bearings with oil. Similar construction is used for bearings on vertical motors also, except that a special labyrinth seal is provided to prevent leakage of lubricant down the shaft.

Oliver No. 197 Automatic Wedge Cutter

WOODEN wedges of various sizes and of various kinds of wood can be cut without requiring further finishing by this machine which has been introduced by the Oliver Machinery Company, Grand Rapids, Mich. Wedges up to 3 in. long, 1⅛ in. wide, and tapering from a point at one end up to ½ in. thick at the other end can be produced. The stock or raw material which is fed into the magazine consists of cross-cut strips, the thickness of which will form the thickness of the wedges, and the length along the grain will be the length of the wedge desired. These strips may be any size up to 10x3 in. so that material of varying widths can be fed simultaneously into the magazine.

Two motors operate this wedge cutter, one ½-hp. motor for the feed, and the other a ½-hp motor for the saw. Both motors are operated by push-button stop and start stations. They are suitable for either a.c or d.c. operation on 110-or 220-volt circuits.

The feed mechanism is adjustable. Feeding forward of a piece is performed by a pusher with suitable movement to provide the exact width of the wedge desired. Drive from the feed motor to the wormgear is by belt. The pulley ratio controls both the vertical movement of the saw motor and the forward feed of the stock, both motions being synchronized in their action. The rate of speed can be changed easily to suit the wedges being cut.

Cutting of the wedges is performed by a 7-in. saw mounted directly on a high-speed motor which has swinging side motion for varying the degree of taper on the wedges, and also has a vertical movement sufficient to cut wedges 1⅛ in. in width. The vertical movement of the saw cuts the second side of the wedge which drops off, and also the first side of the following wedge. Thus each stroke downward produces a complete wedge excepting for the end pieces. Waste material consists only of half a wedge and the stub end.

All moving parts of the machine

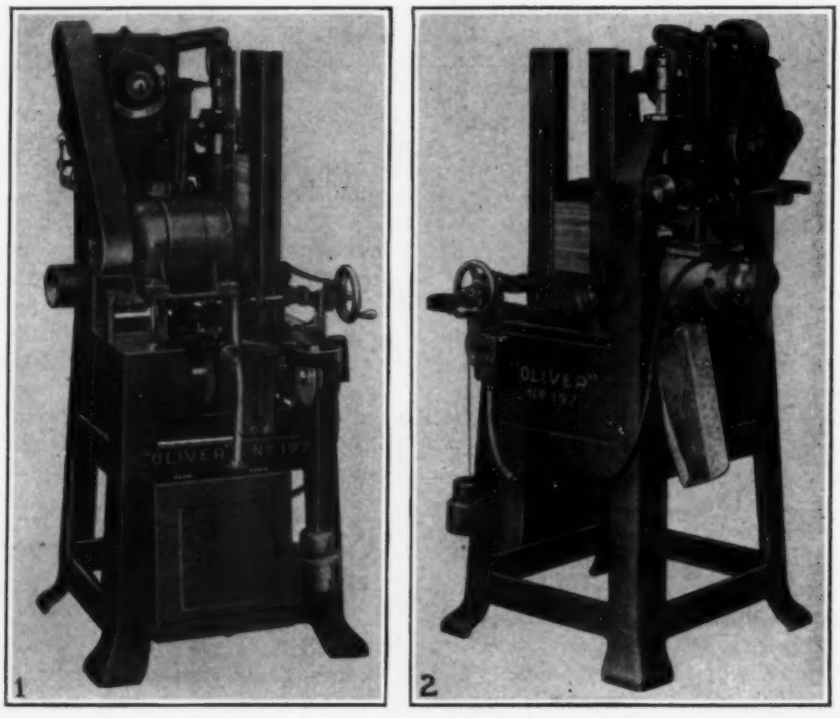
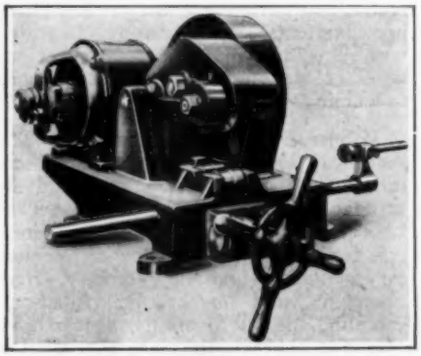


Fig. 1—View of the Oliver No. 197 Automatic Wedge Cutter showing the feed motor and mechanism. Fig. 2—View showing delivery side of the machine

are guarded, and an exhaust hood is built into the machine with outlets for connection to an exhaust system. Alemite lubrication is used on all moving parts, with grease-cup lubrication of the motors. The machine is furnished with two 10-in. saws and one wrench for the saw arbor. Floor space is approximately 30 in. sq.; overall height is 5 ft.; weight of the machine is 520 pounds.

Oster No. 652 Pipe Cutting Machine

Pipe in sizes from ¼ to 2 in. can be cut off on this machine, which has been introduced by the Oster Manufacturing Company, Cleveland, Ohio. Under actual working conditions, production records of 355 ¼-in. pieces per hour and 210 2-in. pieces per hour were obtained. The machine is available in both belt and motor-driven



Oster No. 652 Pipe Cutting Machine

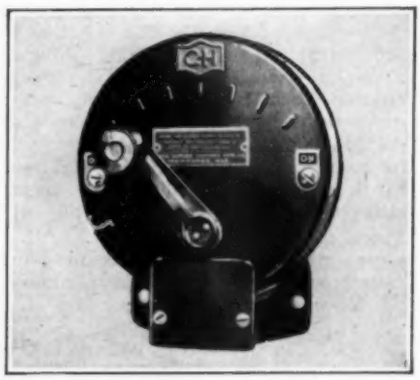
types, and a welded steel stand suitable for mounting either can be supplied.

Compact and simple construction is a feature of this machine. The cutter disk is mounted in the moveable arm which is brought down on the pipe, resting on the rollers. This permits the pipe to remain at right angles to the cutter disk. The action of the arm holding the cutter disk is controlled by a screw feed and handwheel giving compound leverage on the disk. A length gage is provided which can be set to cut off any desired length of pipe. The machine is driven by a 1-hp. motor. The dimensions are, height 17 in., length 26 in., width 18 in., for the belt-driven machine. The net weight of the belt-driven machine is 170 lb., while that of the motor-driven machine is 250 pounds.

Cutler-Hammer D.C. Regulating Rheostat

Small size is the chief feature of this d.c. regulating rheostat which has been placed on the market by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This rheostat can be used to control the speed of fractional-horsepower motors driving small blowers, fans, and buffers. It can be used also as a dimmer on lighting circuits, or as an electric heater regulator.

As shown in the illustration, the

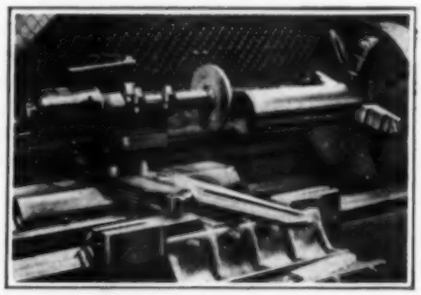


Cutler-Hammer D.C. Regulating Rheostat

device is of circular shape, and is completely inclosed. The standard rheostat is furnished for conduit wiring, but, if open wiring is to be used, a porcelain bushing is added. The essential element consists of a resistance unit imbedded in cement and having brass contact buttons protruding. A contact arm moves over the buttons, varying the resistance. A small, inclosing case with an outside operating lever completes the device.

Scully Adjustable Grinder

Both internal and external grinding on a lathe, shaper, or milling machine can be performed with this adjustable grinder, which has been placed on the market by the Scully Steel & Iron Company, 2364 South Ashland Ave., Chicago, Ill. The device is mounted on the adjustable base used to hold the Scully boring and turning bars described on page 373, Vol. 69, of the *American Machinist*. The adjustable base permits the grinder to be used at different angles, and by turning the base and reversing the spindle housing, the grinder can be used for either external or internal grinding.



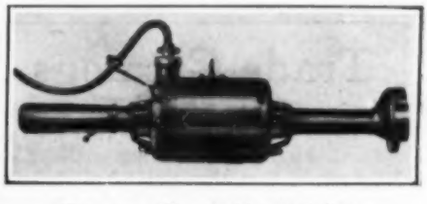
Scully Adjustable Grinder applied to a lathe

The motor operates from the regular lamp socket. Four models are available, suitable for mounting in the four sizes of Scully adjustable boring bars. A $\frac{1}{10}$-hp. motor is used on each. All models carry a 1-in. wheel for internal grinding and a 4-in. wheel for external grinding. In every case, the standard length of spindle housing is 8 in., and the depth which can be ground is 6 in. A housing 18 in. in length and an extension spindle can be furnished.

"Dumore" No. 4 Hand Grinder

High wheel speed of 12,000 r.p.m. is used on this "Dumore" No. 4 hand grinder, which has been placed on the market by the Wisconsin Electric Company, Racine, Wis. Because of its high speed, wheels larger than 2½ in. should have an elastic or rubber bond, in which case it is possible to use a wheel as large as 3 in. in diameter. The arbor on the shaft is fitted with spacing collars so that emery wheels ranging from ⅜ to 1¼ in. thick can be used. A ¼-hp. ball bearing universal motor drives the spindle.

This grinder is intended particularly for the grinding and polishing of the irregularly shaped hardened forging, forming and molding dies. For polishing, the emery wheel can be replaced with emery or sandpaper disks.

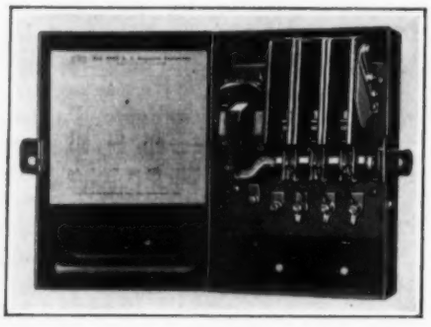


"Dumore No. 4 Hand Grinder

A scratch brush in place of the emery wheel can be used for cleaning rusty surfaces. The tool is 19½ in. in length overall. It comes equipped with 10 ft. of rubber-covered cord with switch and an attachment plug. Its weight is 12 pounds.

Cutler-Hammer A.C. Magnetic Contactors

Two-, three-, and four-pole types of this a.c. magnetic contactor, in capacities ranging from 20 to 150 amp., have been placed on the market by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Two- or



Cutler-Hammer A.C. Magnetic Contactor

three-wire control can be used. With two-wire control, low-voltage release is provided, and with three-wire control, low-voltage protection is incorporated. The line was designed especially for controlling lighting and power circuits automatically.

Among the features of this magnetic contactor are: the hammerhead type magnets with self-aligning armature; continuous-duty magnet coils; hardened steel bushings; tin-dipped solid copper contacts; magnetic blowouts; and chimney-type arc shields. In addition, the large size contactors have the magnetic frame supported on a spring plate which absorbs the shock of the magnet on closing. These contactors are supplied with inclosing case or on a slate panel for switchboard mounting.

Trade Catalogs

D. C. Motors. The Louis Allis Co., Milwaukee, Wis., has published Bulletin 507 showing type "LA" d.c. motors adapted to several different drives. Photographs of these motors driving several types of equipment are shown. The features of construction are described at some length. The catalog contains eleven 10½x8-in. pages.

Gear Shaping in Textile Plants. The Fellows Gear Shaper Co., Springfield, Vt., has published a pamphlet entitled "The Gear Shaper in the Textile Plant," which gives the reasons for cutting replacement gears rather than purchasing cast gears. Many interesting photographs are shown of cutting various types of gears used in textile machinery. Data on the capacity of the No. 6 shaper, a suitable size for the ordinary range of this type of work, are included.

"Gredag" Lubricants. The Acheson Graphite Corporation, Niagara Falls, N. Y., has published a catalog entitled "Industrial Lubrication," which gives the recommended uses for "Gredag" lubricants. These lubricants range in consistency from free-flowing fluids to thick pastes and have the special characteristics necessary for the uses given under each consistency. All of these greases contain Acheson lubricating graphite. The catalog contains 63 9x6-in. pages.

Lift and Tiering Trucks. The Wright-Hibbard Industrial Electric Truck Co., Inc., Phelps, N. Y., has published two pamphlets on lift and tiering trucks, respectively. The lift truck is shown in use in various industries, and, in addition, photographs of important assemblies are given. Specifications of each type and various details of construction are included. Similar material is given for the tiering truck. Both types are electrically driven.

Resistance Thermometers. The Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa., has published catalog No. 80, showing resistance thermometers for controlling, recording and indicating temperatures. These thermometers are shown in use for centralized recording, and also for automatic recording at points of control. The equipment listed includes precision thermometer equipment, temperature-difference equipment, resistance thermometer indicators, recorders, and controllers. Certain accessories are also listed.

Tools for Flat Turret Lathes. The Jones & Lamson Machine Co., Springfield, Vt., has published a booklet entitled "Catalog of Tools for Jones & Lamson Flat Turret Lathes." This catalog gives information about standard tools supplied with the machines and the additional tools available for unusual jobs. Photographs of each tool are given. Additional standard equipment not included in the regular outfits consists of taper turners, profile boring and profile turning attachments, taper boring and taper turning slides, double-facing attachment, releasing-clutch tap holder, roll tap holder, oil tube drill holder, bell pointing tool, two-jawed clutch for holding forged bolts, 6¼-in. small chuck, and standard segment tool plates.

Pamphlets Received

Arc Welding Instruction Book. The Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., has published booklet I.B.5427, entitled "Westinghouse Electric Arc Welding Manual for Training Operators." This book is regularly used as a manual for training arc welding operators at the Westinghouse Welding School. It is arranged in a sequence of instruction and practice, designed to develop the understanding and application of principles while the student develops his skill in welding. Following the basic theory of welding, simple exercises are explained, and some of the more difficult exercises are taken up. The catalog is profusely illustrated with cuts and photographs of various types of welding and the best methods to employ for each.

Mathematical Symbols. The American Engineering Standards Committee approved, in January, 1928, standard No. Z 10 f-1928 known as "Mathematical Symbols." The terminology for arithmetic and algebra, elementary geometry, analytic geometry, trigonometric and hyperbolic functions, calculus, special functions, vector analysis and abbreviations are given. The pamphlet may be obtained from the committee at 39 West 39th St., New York, N. Y., for 30 cents.

The International Cartel Movement. The U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, has published Trade Information Bulletin No. 556, entitled "The International Cartel Movement, by Louis Domeratzky, chief, Division of Regional Information. The movement toward industrial amalgamation may be looked upon as one of the outstanding features of post-war economy, and on that account is receiving an unusual amount of attention. In this pamphlet, the background of the international cartel movement is sketched, together with the economic reasons for such combinations. Germany's prominence in this respect is treated. The movement is further discussed in respect to national cartels, with particular emphasis upon the significance of the post-war development. A bibliography is appended. This pamphlet may be obtained free from the U. S. Government Printing Office, Washington.

NEWS OF THE WEEK

Railway Tool Foremen Meet to Discuss Repair Methods

Exhibit of tools given by the Supply Division

TOOLROOM foremen from the leading railway systems of the country gathered at the Sherman Hotel, Chicago, September 12, 13 and 14, to attend the 16th annual convention of the American Railway Tool Foremen's Association, for the purpose of discussing modern practices as applied to the reconditioning of motive power and rolling stock, and to adopt standardization of tools and methods. Approximately 150 members were present, this group including many tool supervisors.

W. R. Millican, of the Parsons, Kan., shops of the Missouri-Kansas-Texas Lines, was elected president of the association for the forthcoming year, being supported by the following officers: First vice-president, H. P. Jones, of the Oregon Short Line Railway, Pocatello, Idaho; second vice-president, A. A. Ferguson, of the Missouri Pacific Railroad, St. Louis, Mo.; and third vice-president, H. L. Taylor, of the Baltimore & Ohio Railroad, Baltimore, Md. G. G. Macina, was re-elected secretary-treasurer.

New Conditions

In the opening address delivered by P. Kass, emphasis was placed on the trend taking place in car construction which calls for many additional forms of tools and equipment. In part, he said: "Back in the days of wood-car construction, the majority of our men were carpenters who owned their own tools which they kept in repair themselves. Today the situation is greatly different. While we still have carpenters, we also have steel workers and others who are using company-owned tools, the maintenance and repair of which are taken care of by the company.

The most important factor having to do with these tools is their proper construction, which must be supplemented by the proper care on the part of the men using them. The second factor is the maintenance and repair of these tools which is the direct responsibility of the toolroom organization. The third factor is the toolroom equipment needed to handle maintenance and repair work. The tools used by the car department are not unlike those used in the locomotive department. The degree of accuracy required in car work is not as great as that required in locomotive work, but in selecting tools the conditions surrounding their use should be given careful consideration.

President E. A. Greame, of the Delaware, Lackawanna & Western Railroad, in his address called attention to the present-day railroad problems that require the utmost care in handling, in order that suitable economies can be introduced, which in return reduce operating expenses. He spoke in brief of the possibilities in standardizing repair practices, and of the importance of improving the present types of tools in use.

The papers presented and discussed together with the chairman of the committee in charge of each topic were: "Proper Heat Treatment of Steel," by H. L. Taylor; "Standardization of Boiler Tools," by A. A. Ferguson; "Jigs and Devices for the Locomotive Shops," by W. R. Millican; and "Rake and Clearance of Machine Tools," by J. E. Carroll. E. J. McKernan, tool supervisor of the Atchison, Topeka & Santa Fe Railway System, read the report of the standardization committee, which covered such standards as have been accepted by the association during the past year.

D. C. Curtis, chief purchasing officer, of the Chicago, Milwaukee, St. Paul & Pacific Railroad, gave an address on the second day of the meeting, which dwelt on the relationship between the tool foremen and the purchasing department. He stated that full co-ordination between these two divisions is of the utmost importance in order to attain economic operation of the shop. Mr. Curtis also spoke of the value of standardization which has been one of his chief studies in connection with the purchasing of materials.

In connection with the adoption of standards, a résumé of the work accomplished by the American Engineering Standards Committee was outlined to the members, inasmuch as a recommendation has been made to the executive committee to become affiliated with that body.

Paper on Heat-Treatment

In the paper dealing with heat-treatment, two important points were brought out, one of these was the marking of steel for identification, so that proper heat-treatment can be carried out, and the other was the importance of normalizing steels to take out machining and forging strains. Recommendations of equipment required to successfully heat-treat material were discussed thoroughly. In addition, process recommendations for the heat-treatment of carbon and high-speed steels were given.

The paper covering standardization of boiler tools included staybolt taps, beading tools, roller expanders, sectional expanders, and other forms of boiler tools. Three sizes of staybolt taps were recommended, namely, 20, 24 and 27 in. lengths, with either straight or spiral flutes.

Mr. Millican in his report included the description of several modern devices whose use have brought about cost reductions in the reconditioning of locomotive parts. He said that many parts now handled on machines equipped with out-of-date tools could be produced at a greatly reduced cost by providing modern equipment, obtainable at comparatively slight expense. It was stated also that those responsible for production must keep informed on developments in machining methods, and that they must investigate the machines that are being developed constantly, which, in many cases, save their original cost in a comparatively short time. He said: "Not always does cost cutting come through the use of more mechanical equipment. It may be accomplished by putting out of service some equipment and substituting an entirely different method of production. Remarkable achievements have come from the observation of the other fellow's problems, plus a broad vision and a common-sense application of borrowed ideas, a procedure open to all who are engaged in mechanical work. Unless the most efficient tool equipment available is used, a shop must operate at a disadvantage as compared with one in which the tool equipment is kept up-to-date.

List of Exhibitors

The supply division of the association held an exhibit in connection with the convention, demonstrating various forms of tools and equipment applicable for use in railroad shops. The exhibitors were: Armstrong-Blum Manufacturing Co.; Armstrong Bros. Tool Co.; Chas. H. Besly & Co.; Borden Co.; Brown & Sharpe Manufacturing Co.; W. L. Brubaker & Bros. Co.; Buckeye Portable Tool Co.; Carborundum Co.; Chicago Pneumatic Tool Co.; Clark Equipment Co.; Cleveland Pneumatic Tool Co.; Cleveland Steel Tool Co.; Cleveland Tool Engineering Co.; Cleveland Twist Drill Co.; Colonial Steel Co.; Crucible Steel Co. of America.

Davis Boring Tool Co.; J. Faessler Manufacturing Co.; Federal Machinery Sales Co.; Firth-Sterling Steel Co.; Foster-Johnson Reamer Co.; Goddard & Goddard Co.; Greene, Tweed & Co.;

(Continued on page 484d)

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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FROM the Wall Street standpoint last week's three most important happenings were: the sale of a Stock Exchange seat at $410,000, a rise in interest rates which carried time money to 7 per cent, and a decline in the price of sterling exchange which has made gold imports possible.

The advance in the price of Stock Exchange seats is significant because it implies that capital believes in a continuance of the present activity. The high rate paid for time money is regarded as evidence that the holders of stocks are undismayed by the scarcity of credit, and the decline in sterling shows that the tactics followed have been successful, as it is predicted that it will lead to the importation of $25,000,000 in gold.

Whether the rest of the country will view these developments as does the financial community in New York is uncertain, but their effect has been to intensify the spirit of optimism by which business in most lines is now pervaded. No one stops to consider whether the "good times" we are now having are due to inflation or some other stimulus that will ultimately prove to be meretricious. The present is regarded as a golden era for which there is no precedent, and the disposition is to get all that can be had while the getting is good.

Of course, there are some dark spots. The cotton textile industry is one of them, but August shows a slight excess of sales over the reduced production, and manufacturers are hoping that the decline in cotton will still further stimulate distribution. Raw cotton is now approaching 17 cents in the primary Southern markets, and at that figure many spinners are beginning to stock up. In wheat and corn there has also been some investment buying, and a dispatch from Kansas City says that western bank loans indicate that farmers are borrowing largely in order to hold at least a part of their grain crops. A "political advance" in wheat before Election Day is talked of in the agricultural papers, and any further decline seems unlikely, although there is no denying the bearish influence of the Canadian wheat crop, now estimated at 534,000,000 bushels. The foreign grain staples that are speculatively dealt in have also been steady, and have shown obduracy when subjected to pressure.

Sugar appears to be attracting considerable investment demand at 2 cents for raw Cuban which is within $\frac{1}{16}$ of a cent of the lowest price on record. Rubber has recovered somewhat on a report which indicated that the American consumption for August was the largest on record.

Brazilian coffee speculators seem to be able to keep the price up in the face of American opposition, and an increase of speculative interest in raw silk has followed the opening of the New York Silk Exchange last Tuesday. There are now so many of these commodity exchanges that it is quite possible that the opportunities they offer to sagacious traders may attract some of those who have made money in the stock market. If this becomes a reality, the theory of those who believe that we are in a period of inflation will have been vindicated.

Meanwhile all the available statistics indicate expansion. Car loadings are now up to last year's figures. Railroad net earnings for July are 12 per cent over those of the same month in 1927. The chain stores and mail order concerns report a continued increase in sales. Automobile production and distribution are both running ahead of a year ago. The steel industry continues to improve, prices are higher, and a sharp advance in scrap material is reported.

The increase in profits which most large corporations are enjoying is leading to many consolidations. A public utility merger that will be capitalized at over $500,000,000 is announced, and a huge amusement combination involving theatres and moving picture facilities that represent an investment of some $200,000,000 is said to be rumored. As a consequence of these consolidations, much property that has been difficult of conversion will be put in the shape of convertible securities that can be sold or borrowed against, and their distribution may involve a further increase in brokers' loans.

But these loans are now spoken of as "a harmless bogey" by the speculators, who have come to regard themselves as invincible. Therefore the increase of $96,000,000 reported last week attracted only passing attention.

In Europe, as here, the tone is cheerful. British trade showed a substantial gain in August. An attempt to reorganize and consolidate some of the financially crippled cotton mills is under way, and if it is successful the situation will be greatly helped. A better understanding between union labor and British capital is also being brought about, and there is reason to hope that Great Britain's industry is being put upon a sounder basis.

The outlook on both sides of the Atlantic is in fact more satisfactory than at any time previously since the war. While it is always well to be prepared for the unexpected, it seems reasonable and safe to count upon good trade in this country for the balance of the year. It is safer, however, to put a time limit on one's optimism, and it is possible that America's genius for production and salesmanship will have caught up with the demand before next spring.

WHAT'S DOING IN INDUSTRY

IN ONLY one district reporting this week, the South, is there any indication that trade in machine tools and allied lines is below what it was at this time last year. The fall outlook there is promising, however, as it is everywhere, with a large volume of inquiries and sales on the up grade. Considerable buying is being done by the new textile mills both there and in New England, where the machine tool industry is working on full-time schedule. Orders are well balanced, with both small and large tools being sold.

IN NEW YORK the reverse is true in that only small equipment is finding a ready market for the present, although the prospects for a good fall are exceedingly bright, with all kinds of industrial activity reported in that district. Inquiries are heavy there and in Detroit and Cincinnati. In the latter section, buyers are hesitant, but a gain in sales has been recorded in the past week, particularly from automotive shops. In Detroit, of course, the unusual activity in this line is responsible for the present favorable situation of dealers.

AUTOMOTIVE production is also being felt in Chicago, where buying is satisfactory, although not equal in volume to that of the last two weeks in August. Improvement in the used tool market is noted. Automotive activity is similarly the high light of industrial activity in Canada, although a steady upward trend has been noted in general conditions for some time.

THE index of machine tool orders for August was higher than for any similar period since the first half of 1920, according to figures of the National Machine Tool Builders' Association.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

DETROIT

While business in the machinery and machine tool trade here has not been as brisk in the past two weeks as it has been heretofore, the prospects for the balance of the year are better than they have been in many years. During August and September, instead of encountering the usual summer slump, business was even better than in some of the other months and the sale of cars reached heights that have never been equalled before. The machinery business here depends almost entirely on the automotive industry and unparalleled success of this business augurs extremely well for the dealers in equipment and tools here.

All types of machinery and machine tools have been in great demand and this demand seems to be on the upgrade rather than otherwise. The period of quiet during the past ten days or two weeks probably means little as most dealers seem to think the remainder of the year will be at least as good as the first nine months.

Almost all of the automobile manufacturers as well as the body builders and the makers of parts and accessories are receiving more orders than they can handle. The many changes in models of popular cars has brought about many changes in equipment and has kept the dealers far behind in their orders for tools and machines.

Chrysler, Buick, Cadillac, Chevrolet, Graham-Paige, Hupmobile, Willys-Overland and Reo have been enjoying unprecedented business within the past few months. Their sales have jumped at a remarkable rate and in many cases the plants have been forced to expand considerably to take care of the demand. The Motor and Accessory Manufacturers' Association reports better business for this summer than in any previous year at this time. The body builders are all extremely active and are placing orders for equipment from time to time. Continental Motors Corporation has received a great deal of new business within the past few months not only from old customers but from a number of new large buyers of motors both for automobiles and for industrial and agricultural use. The Ford Motor Co. is also doing some buying.

Employment is still going up steadily.

CINCINNATI

A slight gain in the past week is reported by a portion of the machine tool manufacturers in the Cincinnati district, but the majority report that in the period there was no appreciable change in market conditions, which have been above average for this season. Sales are reported as "better than fair," and an upward market trend is expected.

Selling agents report that in the week they did a little better than to hold their own. There is a large need of tools in local territory, especially efficient equipment to replace obsolete, but users are hesitant about buying and postpone the placing of orders as long as they can.

The sustaining feature of the week's market was the sale of single tools to general machinists and miscellaneous users. The buyers were well distributed over the different sections of the country and their orders were well diversified in the matters of sizes and types. While in the aggregate there was a slightly increased amount of business from the automobile manufacturers, their orders were confined almost altogether to single tools for replacement purposes. Several sales of single tools to Eastern manufacturers of automobile parts and accessories are reported.

The majority of the manufacturer report that a good volume of inquiries were received in the week. Inquiries received from the automotive and allied trades were with few exceptions confined to single tools and replacements, and the same applies to the scattering inquiries that came from railroads.

CHICAGO

Activity continues in the machine tool market. While buying during the first two weeks of this month, as compared with the second half of August, is not quite so brisk, business in machinery, particularly in machine tools, is most satisfactory according to reports of manufacturers' representatives and dealers. Heavy production in automotive and auto accessory plants is said to be partly responsible for the sustained demand for certain lines of shop equipment, grinding machines and wheels being especially noted.

Reports from large handlers of used machine tools are practically uniform in declaring that there is a distinct improvement in market conditions, business being better than for some months past. Used automatic screw machines in first-class condition are in unusual demand, with punch presses, planers and shapers following.

A list of about twenty standard tools including some heavy duty units has been issued by the Chicago, Milwaukee, St. Paul and Pacific R.R. and is being acted on by the trade. Buying by other roads still is limited to small lots. Farm machinery builders and tractor producers still constitute an important factor in the market.

CANADA

The trend of the machinery and machine tool industry in Canada continues upward, and a spirit of optimism and confidence in the future is everywhere in evidence.

Automobile manufacturers and makers of parts and accessories are unusually busy. An indication of the expansion of the industry is gleaned from the official government statement that for the seven months ending July 21, the cumulative production of automobiles in the Dominion was 150,214 cars as compared with 137,795 during the corresponding period last year.

Rail mills are still active and a new order for 13,000 tons was recently placed with the Algoma mill by the Canadian Pacific Railway, which will ensure the mill operating at full capacity until rolling for the 1929 railway requirements commence. During recent years rail mills in Canada have usually closed down about the end of May.

It has been announced that the Dominion Bridge Co. will carry out one-third of the work on the new C.P.R. bridge across the Saskatchewan River. An additional contract has also been received from the International Nickel Co. for its plant extension at Sudbury, Ontario.

Structural steel is still in strong demand and warehouse reports all indicate heavy business. Building contracts are now 22.8 per cent ahead of the corresponding period of 1927 and new records are being established. Employment during the month of August showed a further large increase. Construction and manufacturing reported unusually pronounced gains, while the tendency was also favorable in transportation, mining, communications and services.

NEW ENGLAND

The third week in September finds the machinery and machine tool industry on a well maintained business level with full-time working schedules the rule. Other New England industries present favorable reports. The textile industry has been in the market for good sized purchases within its field. A new Bedford mill is spending $100,000 for new automatic looms and a New Hampshire mill has placed orders for 75 of these units. Providence textile concerns are also buying.

Inquiries in the machine tool field hold up well and are anticipatory of increased business. Orders placed during the week were well balanced, and large machines, as well as the smaller units were well represented. The New Departure Manufacturing Co., Bristol, Conn., will equip its proposed 1-story forge shop addition with twelve upset forging machines, one of which will be the largest ever constructed. This company plans other machinery purchases for its Bristol and Meriden plants to make possible a maximum production of 175,000 ball bearings daily.

A fertile field for all manner of construction and conveying machinery is seen in the proposed power projects in Maine and New Hampshire. The New England Power Association has started the $40,000,000 power development at Fifteen-Mile Falls in the latter state; while the Central Maine Power Co. has started a $7,000,000 project at Bingham, Me., on the Kennebec River.

NEW YORK

Except for small machine tools, actual orders have been in small volume during the first two weeks of September. Several dealers handling diversified lines of small tools report considerable activity, while the larger dealers and factory representatives handling larger units complain of the absence of any considerable volume of business. Both classes are agreed, however, that the prospects of a good fall are exceedingly bright, considering the nature and volume of inquiries. Several large deals are pending, concerning which announcement would be premature.

There is every indication of much industrial activity in the metropolitan district. The extent of this activity is reflected by the sales of grinding wheels and drills and cutters which are maintained at a high level. Several of the bearing companies are reported to be busy, Hyatt Roller Bearing Co., for example, is said to be working overtime in some departments on automotive orders and on the new railway bearing. The Federal Bearings Co. is also said to be well occupied with orders. Both these companies have entered the market for machine tools in the past season. The E. W. Bliss Co. bought several machines in the past week for shell production, but no buying for producing the recently acquired Bristol engine is anticipated for some months. Some orders also originated from Brooklyn schools for manual training shops. Railroad buying remains dull.

The Triplex Machine Tool Co. reports the sale of a bench miller to a concern in New Jersey, two Campbell nibblers to aircraft companies, a bandsaw to a manufacturer in New York State, a large flexible press to a printing press maker in New Jersey, and an

upright Sibley drill press to a Jersey concern.

Sales reported by the Pratt & Whitney Co. during the past week were: Three 13-in., four 16-in., and one 20-in. lathes; two 3-in. rotary surface grinders, two jig borers, two centering machines, a No. 11 multiple-spindle drill, a 14-in. vertical surface grinder, seven 6-ft. deep-hole drillers, two die sinkers, two 6-spindle vertical drills, a 5-in. production hand miller, a 12-in. vertical shaper, a 1x18-in. automatic lathe, and a rebuilt vertical shaper. The Niles Tool Works Co. sold an 80-in. Maag gear cutter, a 48-in. car-wheel borer, and a 1,100-lb. steam hammer.

SOUTHERN DISTRICT

The end of summer finds machinery and machine tool business on the up grade in the southern district, and though volume is by no means as heavy as it was at this time last year, it is comparatively close to a normal level for this period. Furthermore, the fall outlook is considered quite promising by many of the larger dealers. this opinion being based on the present volume of inquiries, which is fairly heavy, together with their general tone and reports being received from sales representatives out in the territory.

Fair trade is reported by woodworking machinery distributors, who are booking good orders with some of the larger furniture factories in the Georgia, East Tennessee and Carolina territory, though in other branches of the woodworking business orders are quiet. Quite a few sales are still being reported to textile mills all over the Southeast for new mills now under construction, and for improvement and enlargement programs being carried out by several mills, though as a whole this business is on the decline.

Orders for road building equipment are much less active than they have, and contractors' equipment has also been declining the past few weeks. Garages and service stations continue fairly active in the machine tool market, this business being somewhat better than at this time last season and also probably a little above the normal level. Many of these sales, however, are of used or rebuilt equipment. Smaller machine shops are buying but little at this time. Railroads are also less active in the market.

Herberts-Moore Machinery Co. Established on West Coast

As an outgrowth of the business formerly conducted as a branch of the Herberts Machinery and Supply Co., of Los Angeles, the Herberts-Moore Co., of San Francisco, was formed during the past summer. The directors of this new machinery house comprise the same personnel formerly associated with the branch mentioned, with Charles E. Moore as president, H. L. Dull and D. C. Harrington, vice-presidents, D. H. Frew, treasurer, and W. R. Wilsey, secretary. The firm occupies the entire building, comprising three floors, at 140 First St. and another building at 11 Minna St., connecting with the main building. This building was especially designed to display machine tools, and nearly every type of machine is under power for demonstration.

Mr. Moore has had a wide experience both as a machine tool salesman and as a machinist, having begun his business career as an apprentice. Mr. Dull served his apprenticeship with the Monarch Machine Tool Co., and has been with the Patterson Supply Co., of Toledo, and Strong, Caryle and Hammond, of Cleveland. Both men have had many years' experience with the Herberts company, and Mr. Harrington was formerly sales manager of the company. J. D. Germain and H. C. Seaberg are both machine tool salesmen on the staff of the new firm.

Copper Sales Break Record

Sales of copper during the week ending September 12 were the largest in the four years during which *Engineering & Mining Journal* has kept detailed data, and a new record is established by a considerable margin. The price continues unchanged at 14.75 cents per lb. delivered, Connecticut Valley basis. Sales for the week more than doubled the total reported the week before, which was twice the average itself. Leading interests among the brass and cable manufacturers have been the most active buyers, and an unusually large number of sales were reported for delivery to the Middle West. If the demand for copper continues at the present rate, it is predicted that the price will probably advance.

Seaman Body Plans $2,000,000 Plant Extension

Although it has only recently completed a large factory addition costing about $250,000, the Seaman Body Corporation, Milwaukee, a half interest in which is owned by the Nash Motors Co., Kenosha, Wis., is embarking on a two-year plant enlargement program involving $2,000,000. Contracts were recently let for the first of a series of buildings, the unit to be 100x385 feet, 5-story. The lower floor will be for a metal and press room, to be equipped with a battery of presses for stamping out steel body parts. Upon its completion in January, work will start on another wing.

Railway Tool Foremen Discuss Repair Methods

(Continued from page 484a)

Greenfield Tap & Die Corporation; Hunter Saw & Machine Co.; Independent Pneumatic Tool Co.; Ingersoll-Rand Co.; International Trade Press, Inc.; King Pneumatic Tool Co.; Latrobe Tool Co.; Lovejoy Tool Works; Manning, Maxwell & Moore, Inc.; Morse Twist Drill & Machine Co.

National Twist Drill & Tool Co.; Norton Co.; Pratt & Whitney Co.; *Railway Journal; Railway Purchases & Stores;* Rich Tool Co.; Scully-Jones Manufacturing Co.; Scully Steel & Iron Co.; Simmons-Boardman Publishing Co.; Standard Tool Co.; L. S. Starrett Co.; D. A. Stuart & Co.; Vanadium-Alloys Steel Co.; Whitman-Barnes Detroit Corporation; Whitney Metal Tool Co.; J. H. Williams & Co.; and Ziv Steel & Wire Co.

The association held its annual banquet on Thursday, September 13. On the previous evening, the members attended a theatre party given them by the supply dealers.

Timken Forms Separate Steel and Tube Company

Announcement has just been made by the Timken Roller Bearing Co. of the incorporation of a new company, known as the Timken Steel and Tube Co., which will take over the manufacture and selling of Timken steel and tubing. The headquarters and mills are in Canton, Ohio, with sales offices in Chicago, Los Angeles, Detroit and New York. The officers are: H. H. Timken, chairman; M. T. Lothrop, president; J. W. Spray, vice-president; A. J. Sanford, vice-president in charge of sales; J. E. Daily, vice-president in charge of operations; and J. F. Strough, secretary and treasurer. The mill is equipped to supply any section or size of hot rolled bar stock, or seamless tubing, in any quantity desired.

Spender Heater Co. to Build New Type Aircraft Engine

The Spender Heater Co., subsidiary of the Lycoming Manufacturing Co., will introduce in January a radically new type of aircraft engine, it is reported by *Daily Metal Trade.* This type of aircraft engine will be used by automobile companies, especially the Gardner Motor Corporation, which recently organized a $2,000,000 company to build airplanes. The Auburn Automobile Co., which controls the Lycoming concern is also said to be considering entering the airplane industry on a large scale.

Continental Motors to Build Airplane Engine

According to a Detroit report, the Continental Motors Corporation has entered the airplane motor field and has established an aeronautical division which is in charge of Robert Insley, who has been assistant chief of the United States Air Corporation's materials division at Wright Field, Dayton, for the last eight years. Development of three motors of five, seven and nine-cylinder, air-cooled, radial type has been made with other types now being developed. It is also expected that the production of a seven-cylinder, 120-horsepower motor will be started early next year.

Little Damage to Machine Tool Shops in Rockford

Little damage occurred to machine tool plants in Rockford, Ill., during the storm on September 14 that wrecked one factory of the Rockford Chair and Furniture Co., with attendent loss of life. The disturbance was confined to a narrow strip through the southeast end of the city and other sections were unaware of the storm. The Elco Tool Co., a company making small woodworking tools, was entirely demolished, but none of the large shops, even those near the affected area, such as Greenlee Bros. & Co., reported any damage.

Business Items

The Hayes Malleable Iron Co., 231 S. La Salle St., Chicago, has been incorporated with a capital of 4,000 shares, no par value. The company will manufacture, buy, sell and deal in and with all kinds of steel, iron and other metals.

The Welding Appliance Co., 162 N. Clinton St., has been incorporated by W. H. Abbott, with 1,000 shares of no-par value stock to manufacture and deal in welding machines and appliances.

The Piedmont Iron Works, recently organized and incorporated at Gastonia, N. C., with a capital stock of $100,000, by K. M. Glass, of that city, and associates, is reported contemplating the establishment of a new machine shop project at that city, it was announced recently.

Letters of incorporation have been granted to J. I. Case Co., Inc., South Independence Ave., Rockford, Ill., for the manufacture of agricultural implements. Capital 100 shares of no par value. The incorporators are: E. J. Gittens, Theodore Johnson and M. F. Miller.

Directors of the Stanley Works, New Britain, Conn., have declared the regular quarterly dividend of 2½ per cent on the common stock, payable October 1 to stock of record September 15; and regular dividend of 1¾ per cent of the preferred stock, payable November 15 to stock of record November 3.

The financial report of the Peck, Stow & Wilcox Co., Southington, Conn., hardware manufacturers, shows current assets at $1,905,729 as of June 30, 1928. Current liabilities were $377,763 on that date. The surplus was $1,164,915 as compared with $1,442,956 a year ago. Total assets were $3,558,355 as compared with $3,860,076 in 1927.

The Southern Railway System recently opened at Macon, Ga., a new machine shop and locomotive roundhouse, construction of which has been underway for some months, an investment of approximately $1,000,000 being involved in this project. Considerable new machinery was installed in the machine shop project, entailing a considerable investment. The locomotive shops are among the largest in the South.

The Beardsley & Wolcott Manufacturing Co., Waterbury, Conn., through a vote of its stockholders will acquire the business of the Berbecker & Rowland Manufacturing Co., Waterbury, through an exchange of stock and cash. Shares of the Beardsley & Wolcott stock will be increased from 44,000 to 66,000 shares, now selling at $30. The Beardsley & Wolcott firm make electric specialities.

The Lincoln Electric Co., of Cleveland, announces the opening of a San Francisco office at 533 Market St. in charge of W. S. Stewart. Other changes announced are: L. P. Henderson, formerly of the Chicago office, has been put in charge of the Minneapolis district; Robert Notvest has been transferred from Kansas City to Indianapolis, where he will be in charge of that district, and R. E. Mason has been assigned to Kansas City to replace Mr. Notvest; N. L. Nye has been stationed at Akron, Ohio, under R. P. Tarbell, manager of the Cleveland district.

Additions and improvements to the plant of the Federal Foundry Co. in Indianapolis, manufacturer of stove castings, will make possible the employment of approximately 150 more men. Building additions now begun include shipping rooms, machine shops, sand storage bins and board storage bins and the work, when completed, will cost approximately $40,000. The foundry products are shipped to the division points of the American Stove Co. of St. Louis.

A reorganization of Mackintosh-Hemphill Co., Pittsburgh, has been consummated and new interests have taken over the management of the company. The board of directors of the reorganized company consists of H. V. Blaxter, John W. Chalfant, Edwin Hodge, Jr., Herbert A. May, J. H. O'Neill, W. C. Rice and T. C. Ward, and the following officers have been elected: H. V. Blaxter, chairman of the board; F. H. Moyer, vice-president; W. C. Rice, treasurer, and D. H. Baum, secretary and assistant treasurer.

The Bridgeport Chain Co., Bridgeport, Conn., has been acquired by the Round interests of Cleveland, Ohio, and will continue to function as the Bridgeport Chain & Manufacturing Co. The Round company began as David Round & Son, about 60 years ago, and controls the Cleveland Chain & Manufacturing Co., Cleveland; the Krein Chain Co., Wapakoneta, Ohio; and the Seattle Chain & Manufacturing Co., Seattle, Wash. L. D. Round of Cleveland is president of the new company, and L. D. Cull secretary and treasurer. Other anticipated changes in the personnel have not been announced.

Personals

JAMES G. BOSSERT succeeds his father, Ernest J. Bossert, who died recently, as manager of the Bossert Machine Co. of Cincinnati.

LOUIS K. LIGGETT, chairman of the board of the Winchester Repeating Arms Co., New Haven, Conn., has been elected chairman of the executive committee.

GEORGE N. JEPPON, vice-president and production manager of the Norton Co., of Worcester, Mass., has returned from a visit to Norway and Sweden.

LT.-COM. JAMES MCREADY, U. S. Navy (retired), has become associated with the firm of Black & Bigelow, Inc., air transport engineers, of New York City.

JAMES L. DONNELLY, Secretary of the Western Cartridge Co., East Alton, Ill., has been elected executive vice-president and secretary of the Illinois Manufacturers' Association.

EDWIN R. WENGER has been elected president of the Detroit Forging Co. and a member of the board of directors. For the last two months he has been general manager.

WALLACE G. IMHOFF, formerly metallurgist of the electrical materials department of Hubbard & Co., Pittsburgh, has become president of the Wallace G. Imhoff Co., Pittsburgh, consultant in zinc coating.

H. H. SHERMAN has been appointed manager of the publicity department of the Chicago Pneumatic Tool Co., with headquarters at 6 E. 44th St., New York, N. Y. He joined the company in 1927 as assistant publicity manager.

W. E. TIERNEY has been appointed representative in the South and Southwest of the Botfield Refractories Co., of Philadelphia, maker of Adamant fire brick cement, Adamant-Adachrome and the Adamant gun. His headquarters will be in New Orleans.

ALBERT WALTON, Melrose Park, Philadelphia, Pa., has been named Eastern Representative of the Gray Iron Institute. He will maintain headquarters in Philadelphia and will further the interests of the Institute in New York, New Jersey, Pennsylvania and New England.

JAMES BURKE has been elected chairman of the board of directors of the Burke Electric Co., Erie, Pa., to fill the vacancy made by the death of Isadore Hernsheim in August. Officers elected at the same time were: Geo. H. Winkler, president; R. W. DeLancey, vice-president; G. Irving Blake, treasurer; Chas. H. Schum, secretary; and C. J. Gibson, assistant treasurer.

Obituaries

CLARENCE F. HOTCHKISS, president of the Stowe Manufacturing Co., Binghamton, N. Y., maker of flexible shaft equipment, died on Sept. 9. D. Walker Wear, vice-president is in charge of the company at present.

DR. ANDREW HENRY PATTERSON, Dean of the School of Applied Science of the University of North Carolina for the last seventeen years, died on Sept. 9 at Little Boar's Head, N. H. He was a brother of Rufus L. Patterson, president of the American Machine & Foundry Company, of Brooklyn.

DR. KURT OSCAR SORGE honorary president of the Federal Association of German Industries, member of the Federal Economic Council, and for many years a prominent member of the administration of the Krupp works died on Sept. 10 in Berlin. He was seventy-three years old. After an extensive career in German steel works Dr. Sorge entered the Krupp service in Essen in 1893, becoming a principal director six years later. During the latter years of the World War he was technical director in the War Ministry.

GEORGE SHERMAN HADLEY, secretary of Harvey Hubbell Inc., Bridgeport, Conn., died September 9 at his home in that city. Mr. Hadley was born in a Bridgeport suburb and was 53 years old. He was a nephew of the late Harvey Hubbell, who founded the electrical manufacturing company. Mr. Hadley had been connected with the company since a boy of 17 and had worked his way step by step until he was elected secretary several years ago.. He was prominent in the social affairs of the city and organizer and leader of the Manufacturers Chorus. He was a member of the Algonquin Club and was a noted grower of flowers.

Forthcoming Meetings

Machine Shop Practice Division, American Society of Mechanical Engineers. National meeting, Cincinnati, Sept. 24-26. Part of sessions to be on steamer "Cincinnati." Secretary, Carlos de Zafra, 29 W. 39th St., New York City.

American Society of Mechanical Engineers. Boston Regional meeting, Oct. 1-3. C. E. Davies, secretary, 29 W. 39th St., New York City.

National Safety Council. Seventeenth annual safety congress to be held in New York, October 1-5. W. H. Cameron, managing director, 108 E. Ohio St., Chicago.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Welding Society. Fall meeting and exposition, Exhibition Hall of Commercial Museum, Philadelphia, Pa., Oct. 8-12, in conjunction with "National Metals Exposition" of the American Society for Steel Treating. Miss M. M. Kelly, secretary, 29 West 39th St., New York City.

Institute of Metals, Division of American Institute of Mining and Metallurgical Engineers. Annual fall meeting during National Metal Week, Oct. 8-12, Benjamin Franklin Hotel, Philadelphia. W. M. Corse, secretary, 810 18th St., N. W., Washington, D. C.

American Gear Manufacturers' Association. Semi-annual meeting, including joint session with the Machine Shop Practice Division of the American Society of Mechanical Engineers, Statler Hotel, Buffalo, N. Y., Oct. 11-13. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

Society of Industrial Engineers. Fifteenth annual convention, Rochester, N. Y., October 17-19, in conjunction with the Industrial Management Council of the Rochester Chamber of Commerce. George C. Dent, executive secretary, 205 Wacker Drive, Chicago.

National Manufacturers' Association. Combined assembly with the National Industrial Council in New York City, October 22-24. George S. Doudinot, secretary, 11 W. 42nd St., New York City.

American Management Association. Autumn convention, Palmer House, Chicago, Nov. 13-15. W. J. Donald, managing director, 20 Vesey St., New York City.

Iron and Steel Division, American Society of Mechanical Engineers. Second national meeting, Chicago, November 14-15. Thomas Wilson, chairman of Chicago local section host, 7 S. Dearborn St., Chicago.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., New York, week of Dec. 3. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

IN THE iron and steel market prices of basic materials are rising. Valley pig iron is up 50c. per ton for foundry, 25c. for basic; at Cleveland, up 50c. Indications are for a third-quarter price of $1.95 for finished steel. Prices for old materials continue to advance, giving further proof of the firmness in pig iron. Last week's copper sales were the largest in recent years.

(*All prices as of Sept.* 13, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$19.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.12
BIRMINGHAM	
No. 2 Foundry	16.25
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	20.76
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.51
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4 50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.35	3.25	3.90*
No. 12	2.15@2.25	3.40	3.30	3.95*
No. 14	2.25@2.35	3.45	3.35	4.00*
No. 16	2.35@2.45	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.40@2.45	3.60	3.20	4.00
No. 22	2.55@2.60	3.75	3.35	4.15
No. 24	2.60@2.65	3.80	3.40	4.20
No. 26	2.70@2.75	3.90	3.50	4.30
No. 28	2.85@2.90	4.05	3.65	4.45
Galvanized				
No. 10	2.70@2.90	3.95	3.55	4.25
Nos. 12 to 14	2.80@3.00	4.05	3.65	4.35
No. 16	2.90@3.10	4.15	3.75	4.45
No. 18	3 05@3.25	4.30	3.90	4.60
No. 20	3.20@3.40	4.45	4.10	4.75
No. 22	3 25@3.45	4.50	4.15	4.80
No. 24	3.50@3.65	4.65	4.25	4.95
No. 26	3 65@3.85	4.90	4.50	5.20
No. 28	3.90@4.10	5.15	4.75	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—Price per Foot: ½	⅝	¾	⅞	1	1⅛	1¼
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{3}{16}$@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, $\frac{3}{32}$, 8.35c.; ⅛, 7.85c.; $\frac{5}{32}$ to ¼ 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			16.00
Tin, Straits, pigs, New York			49.00
Lead, pigs, E. St. Louis	6.25	New York	7.00
Zinc, slabs, E. St. Louis	6.25	New York	7.12½

	New York	Cleveland	Chicago
Antimony, slabs	13.00	13.00	14.25
Copper sheets, base	23.50	23.50	23.50
Copper wire, base	20.12½	19.62½	16.75*
Copper bars, base	22.00	22.00	22.50
Copper tubing, base	25.00	25.00	25.00
Brass sheets, high, base	19.25	19.25	19.25
Brass tubing, high, base	24.12½	24.12½	24.12½
Brass rods, high, base	17.00	17.00	17.00
Brass wire, high, base	19.75	19.75	19.75

*At mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%	25.00*	24.30	24.30
Zinc sheets (casks)	10.00@10.50	11.00	9.61
Solder (strictly)	32.25	30.75	31@34
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade			67.00
Commercial genuine, intermediate grade			53.00
Anti-friction metal, general service			31.50
No. 4 babbitt (f.o.b.)			12.25
Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:			
Ingots 35.00	Electrolytic 37.00	Shot	36.00

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	28.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f. o. b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper	12.75 @13.00	12.00	11.75@12.25
Copper, heavy, and wire	12.00 @12.75	11.25	11.25@11.75
Copper, light, and bottoms	10.87½@11.12½	9.75	10.00@10.50
Heavy lead	5.12½@ 5.37½	5.25	4.75@ 5.25
Tea lead	3.62½@ 3.87½	3.75	3.75@ 4.25
Brass, heavy, yellow	7.25 @ 7.50	7.75	7.25@ 7.75
Brass, heavy, red	10.00 @10.37½	10.00	9.50@ 9.75
Brass, light	5.87½@ 6.12½	6.25	6.25@ 6.75
No. 1 yellow rod turnings	8.00 @ 8.50	7.75	7.75@ 8.25
Zinc	3.25 @ 3.50	3.25	2.87½@3.37½

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20	6.45	6.10	7.00
	Terne Plates—8-lb. Coating—Small lots—Per box			
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb	.15½	38.00 per M	.17
Sal soda, per lb	.02	.02	.02
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb	.105	.105	.103
Cutting oil, about 25% lard, in 5 gal. cans, per gal	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply.:			
Medium grade	30–10%	30–10%	35%
Heavy grade	25–5%	30–5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	50%	50–10%	50%
Second grade	60%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0325	$0.0325	$0.0324
Cold drawn shafting	per lb.	.034	.034	.04
Brass rods	per lb.	.17	.17	.16
Solder (½ and ½)	per lb.	.3225	.3225	.39
Cotton waste, white	per lb.	.10@.13½	.10@.13½	.10@.13½
Emery disks, cloth, No. 1, 6-in. dia	per 100	3.05	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.30	.30	.27
Belting, leather, medium	off list	30–10%	30–10%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$4.29	$4.29	$4.29
*Emery paper	10.71	10.71	10.71
†Emery cloth	20.97	20.97	20.97
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.32	1.32	1.32
Cloth	3.05	3.05	3.05
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville, 2.75@3.00		
Coke, prompt foundry, per net ton	Connellsville, 4.00@4.50		
White lead, dry or in oil	100 lb. kegs	New York, 13.25	
Red lead, dry	100 lb. kegs	New York, 13.25	
Red lead, in oil	100 lb. kegs	New York, 14.75	

*4½ reams and under. †Less than 2 reams.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger up to 1 x 30-in.	50%
1¼ and 1½ in. dia.	35%
Carriage bolts:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb	$3.50*
Rivets, button and cone head:	
Small, including 7/16-in. dia	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Mich., Detroit — Briggs Mfg. Co., 11631 Mack Ave.—equipment for handling bodies and body parts for proposed addition to plant.

Mich., Detroit — Dept. of Purchases & Supplies, J. A. Mills, Comr.—engine lathe and combination punch and shear.

Mich., Detroit—Detroit Gasket Co., 6209 Hamilton Ave.—miscellaneous equipment for the manufacture of gaskets for gas engines, etc. for proposed 1 story, 116 x 200 ft. factory. Estimated cost $80,000.

Mich., Detroit — Manufacturers' Machine Products Co., 1320 Mt. Elliott Ave. (special tools and machines)—drill and equipment.

Mich., Detroit—Selik Tool & Die Co., 1831 Van Dyke Ave.—milling machine.

N. Y., Long Island City — Jerome W. Hurych Mfg. Co., 2431 Kindred St., Astoria, L. I.—lathes of different sizes, milling machines, two or three planers, compressed air forging equipment, shaper, automatic gear cutter and automatic screw machine.

Ont., Brantford—Bd. of Education, A. K. Bunnell, Secy.—prices and catalogs on complete equipment including lathes, etc. for proposed vocational school on Brant Ave.

Opportunities for Future Business

Calif., South San Francisco—Marchetti Motor Patents Inc., Russ Bldg., San Francisco, plans the construction of a motor plant building and airplane factory at Bayshore Highway, here. Estimated cost $300,000. A. W. Ryder, Russ Bldg., San Francisco, Archt.

Conn., Bridgeport—Bridgeport Hardware Mfg. Co., 461 Iraniston Ave., awarded contract for a 3 story, 45 x 100 ft. factory. Noted Aug. 30.

Conn., Bristol—New Departure Mfg. Co., 269 North Main St., will soon award contract for the construction of a 1 story, 125 x 200 ft. factory on Terryville St. Estimated cost $75,000. Lockwood, Greene & Co., 24 Federal St., Boston, Mass., Archts. Noted Sept. 13.

Conn., Stamford—Southern New England Telephone Co., 157 Church St., New Haven, is receiving bids for a 1 story, 87 x 162 ft. garage on Jefferson St. Estimated cost $60,000. R. W. Foote, 185 Church St., New Haven, Archt.

Ill., Canton—International Harvester Co., H. W. Bland, Engr., awarded contract for 1 story additions to grinding building, steel storage and shearing department, etc. Estimated cost $100,000.

Ill., Cicero (br. Chicago)—Oldfield Engineering Co., 2632 West 26th St., manufacturers of gas plant equipment, awarded contract for the construction of a 150 x 643 ft. factory at 54th Ave. and 16th St. here.

Ill., Chicago—International Steel & Iron Co., 3136 West 51st St., awarded contract for a 1 story, 156 x 320 ft. factory at 3100-26 West 51st St. Estimated cost$45,000.

Ind., Indianapolis—Lauth Chevrolet Co., Brookville Rd. and East Washington St., will soon award contract for a 1 story, 154 x 170 ft. machine shop and service building. Estimated cost $85,000.

Md., Baltimore—International Harvester Co., 81 Mosher St., will receive bids until Sept. 26 for a 1 story, 125 x 260 ft. service station at 25th and Kirk Sts. W. D. Price, 606 South Michigan Ave., Chicago, Ill., Supt. of Const. Noted June 21.

Mass., East Boston (Boston P.O.)—Bethlehem Shipbuilding Corp., awarded contract for a 3 story addition to factory at 80 Border St. Estimated cost $40,000.

Mass., New Bedford—Continental Wood Screw Co., P. Sweeney, awarded contract for a 2 story, 60 x 100 ft., addition to plant on Mount Pleasant St. Estimated cost $50,000. Noted Sept. 13.

Mass., North Easton — Ames Shovel & Tool Co., Main St., awarded contract for a 1 story, 60 x 400 ft. factory on Main St. Estimated cost $100,000.

Mass., Worcester—Fay Barry Motor Co., 63 Harding St., is having plans prepared for the construction of a garage on Harding St. Estimated cost $40,000. Frost Chemberlain & Edwards, 390 Main St., Archts.

Mass., Provincetown — American Motorless Aviation Co., Box 411, Cornhill, or c/o J. C. Penney Co., 330 West 34th St., New York, N. Y., is having plans prepared for the construction of a hangar and assembly plant here. Private plans.

Mich., Detroit — Briggs Mfg. Co., 11631 Mack Ave., is having plans prepared for a 1 story, 80 x 100 ft. addition to automobile body plant on Mack St. A. Kahn, 1000 Marquette Bldg., Archt.

Mich., Detroit — Graham Paige Motor Corp., 8505 West Warren Ave., awarded contract for the construction of a 2 story, 60 x 300 ft. building for engineering department on Warren Ave. Estimated cost $150,000.

Mich., Lansing—Olds Motor Works, 1101 Division St., awarded contract for the construction of a 2 story, 130 x 460 ft. addition to automobile plant on Division St. Estimated cost $350,000. Noted Sept. 13.

N. H., Hanover—Bd. of Selectmen, is receiving bids for a 2 story, 50 x 90 ft. repair and service garage. Estimated cost $50,000. Wells & Hudson, Archts. Noted June 7.

N. J., Hillside—Austin Co., 120 Broadway, New York, N. Y., Engr., is receiving bids for the construction of a 2 story factory here for the manufacture of toy trains for Lionel Corp., 24 Neslett St., Newark. Estimated cost $40,000.

N. J., Jersey City—J. T. Rowland, 30 Journal Sq., Archt., is receiving bids for a 2 story, 35 x 132 ft. perforated metal factory on Johnson Ave. for C. Mundt & Sons, 53 Fairmount Ave. Estimated cost $40,000.

N. J., Newark—G. Jones, 24 Commerce St., Archt., will receive bids about Oct. 15 for the construction of a 7 story, 52 x 116 ft. garage at 65-67 Clinton St. for Clinton St. Garage Inc., 247 Market St. Estimated cost $200,000.

N. J., West New York—B. Gilardoni, 324 11th St., will soon award contract for the construction of a 2 story, 100 x 102 ft. garage at 324 11th St. Estimated cost $150,000. J. Weber, 132 26th St., Guttenberg, Archt. Noted June 14.

N. Y., Auburn—Commissioner of Correction, Albany, will soon award contract for the construction of a new shop building at Auburn State Prison here.

N. Y., Binghamton—National Cigar Box Co., E. Von Nostitz, 320 Water St., awarded contract for a 2 story addition to factory at 320 Water St.

N. Y., Brooklyn—F. F. Pannaman, 26 Court St., Archt., will receive bids after Oct. 15 for the construction of a garage at Gravesend Ave. and Ave. M for S. & A. Ragonesi, 2063 61st St. Estimated cost $50,000.

N. Y., Hollis—C. Hedwig, 98-02 195th St., plans the construction of a 80 x 97 ft. garage at 195th St. and 98th Ave. Estimated cost $50,000. E. Guterman, 164 Montague St., Brooklyn, Archt.

N. Y., Long Island City — B. Gunlach, 597 5th Ave., New York, N. Y., will receive bids in November for a 3 story, 125 x 168 ft. garage at Hillside St. and Parsons Blvd. here for Nash Queens Motor Co., 94-30 Merrick Blvd., Jamaica. Estimated cost $250,000. Noted Sept. 6.

N. Y., Niagara Falls—Haeberle Lumber Co., G. Haeberle, Pres., 1004 Cedar Ave., is receiving bids for a 2 story addition to lumber mill at 1004 Cedar St. C. P. Phelps, Gluck Bldg., Archt.

N. Y., New York—C. Buckley, 224 Creston Ave., is receiving bids for a 2 story, 100 x 100 ft. garage at Haviland and Havemeyer Sts. Estimated cost $60,000. J. J. Dunigan, 2382 Grand Concourse, Archt. Noted Sept. 6.

N. Y., New York—I. Shernon, 1136 Fox St., plans the construction of a 4 story, 50 x 107 ft. garage at 167th and 168th Sts. Estimated cost $55,000. Bleich & Gottlieb, 708 East Tremont Ave., Archts.

N. Y., New York—Varsity Realty Corp., H. Diamond, Pres., 110 East 42nd St., is receiving bids for the construction of a 2 story, 77 x 130 ft. garage at 158th St. and River Ave. Estimated cost $40,000. C. S. Clark, 441 East Tremont Ave., Archt. Noted Sept. 6.

N. Y., New York—Whitlock Realty Corp., W. J. McCormick, Pres., 1050 Whitlock Ave., plans the construction of a 1 story, 94 x 166 ft. garage at Whitlock and Westchester Aves. Estimated cost $45,000. C. A. Price, 419 4th Ave., Archt.

O., Alliance — Morrison Jack Co., F. A. Hailes, Pres., will soon receive bids for addition to factory. Estimated cost $40,000.

O., Cleveland—Cleveland Cutter & Reamer Co., 7406 Madison Ave., had plans prepared for a 1 story, 39 x 79 ft. addition to machine shop at 7406 Madison Ave. Estimated cost $40,000. Private plans.

O., Cleveland—Cleveland Wire Spring Co., C. H. Erickson, V. Pres. and Gen. Supt., East 49th and Harvard Sts., awarded contract for a 1 story, 20 x 42 ft. addition to factory and shipping room. Estimated cost $100,000. Noted Sept. 6.

O., Cleveland—Ontario Street Land Improvement Co., J. E. Latimer, Pres., Union Trust Bldg., awarded contract for a 1 and 2 story, 120 x 200 ft. garage at 1212 Carnegie Ave. Estimated cost $75,000.

O., Cleveland—W. S. Tyler Co., 3600 Superior Ave., manufacturers of ornamental iron and bronze, will soon award contract for a 5 story, 66 x 97 ft. addition to plant on East 36th St. Estimated cost $350,000.

Ore., Lincoln (mail North Plains)—J. H. Henry, Pasadena, Calif., plans the construction of a saw and planing mill, 50,000 ft. capacity in 8 hours, near Pinehurst on Ashland Klamath Falls, east of Medford, Ore. Estimated cost $200,000. H. E. Tabor, Pasedena, Calif., Engr.

Pa., Columbia—Columbia Malleable Castings Co., c/o L. R. Zifferer, Pres., Second and Linden Sts., awarded contract for the construction of a 1 story addition to foundry at Second and Linden Sts. Estimated cost $100,000.

Pa., Philadelphia—Railway Track Work Co., E. Thompson and Clementon Sts., manufacturers of machinery, awarded contract for a 1 story, 55 x 100 ft. factory at Westmoreland and Tulip Sts.

Tex., Dallas—The Crane Co., 836 South Michigan Ave., Chicago, Ill., manufacturers of plumbing supplies, plans the construction of a branch plant here including machine shops, etc. Estimated cost $75,000.

Tex., Houston—The Neal Lucy Co., 60 North Hamilton St., manufacturers of oil well supplies and oil well drilling equipment announced plans for the construction of a plant including foundry and machine shop buildings. Estimated cost $30,000.

Tex., San Antonio—Smith Bros. Properties Inc., 117 Villita St., plans the construction of a 7 story, 90 x 110 ft. garage at Villita and Dwyer Sts. Estimated cost $400,000. A. B. & R. M. Ayres, Bedell Bldg., Archts.

Utah, Cedar City—Union Pacific Ry., 15th and Dodge St., Omaha, Neb., awarded contract for the construction of a machine shop here.